PMM

The magazine for design, finishing and the use of:

SINTERINGS • INVESTMENT CASTINGS • EXTRUSIONS
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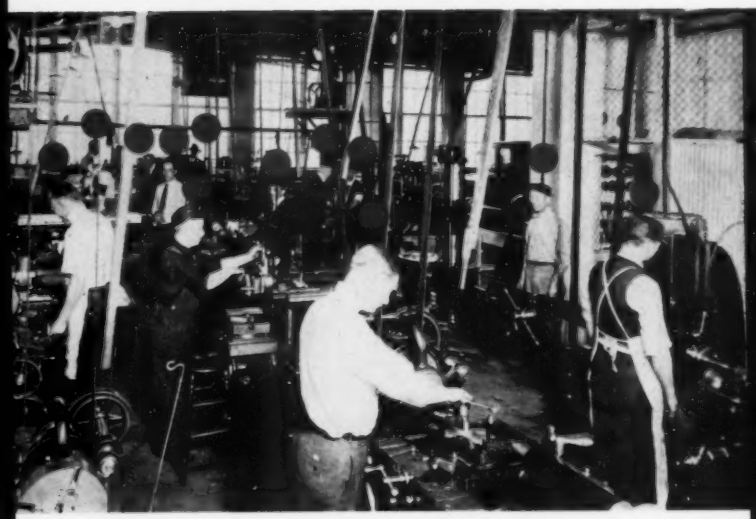
PERMANENT MOLD CASTINGS • DIE CASTINGS

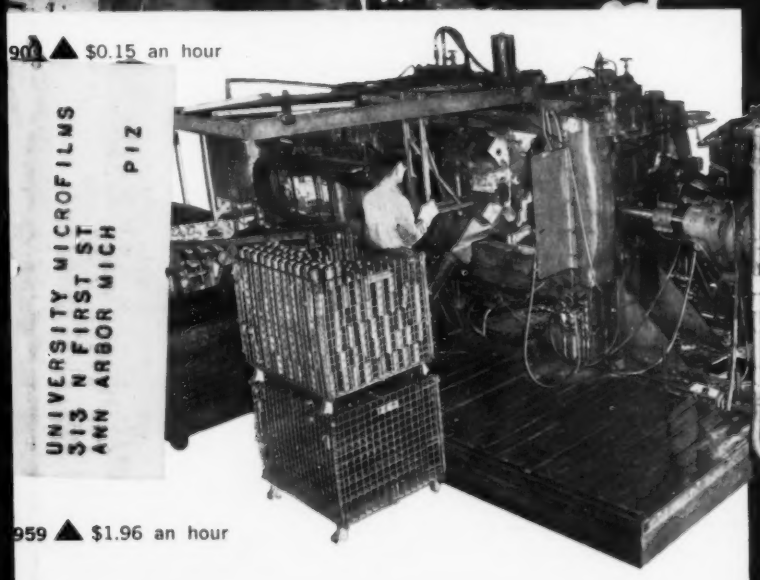
SEPTEMBER 1959

Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE



Die Casting Forecast Issue



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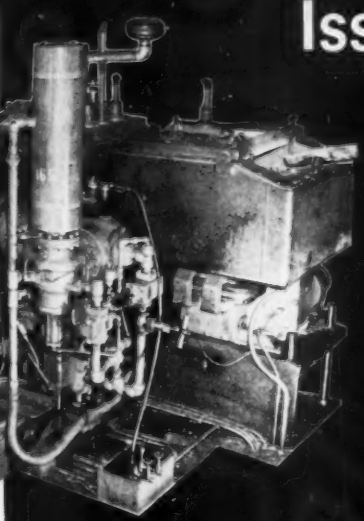

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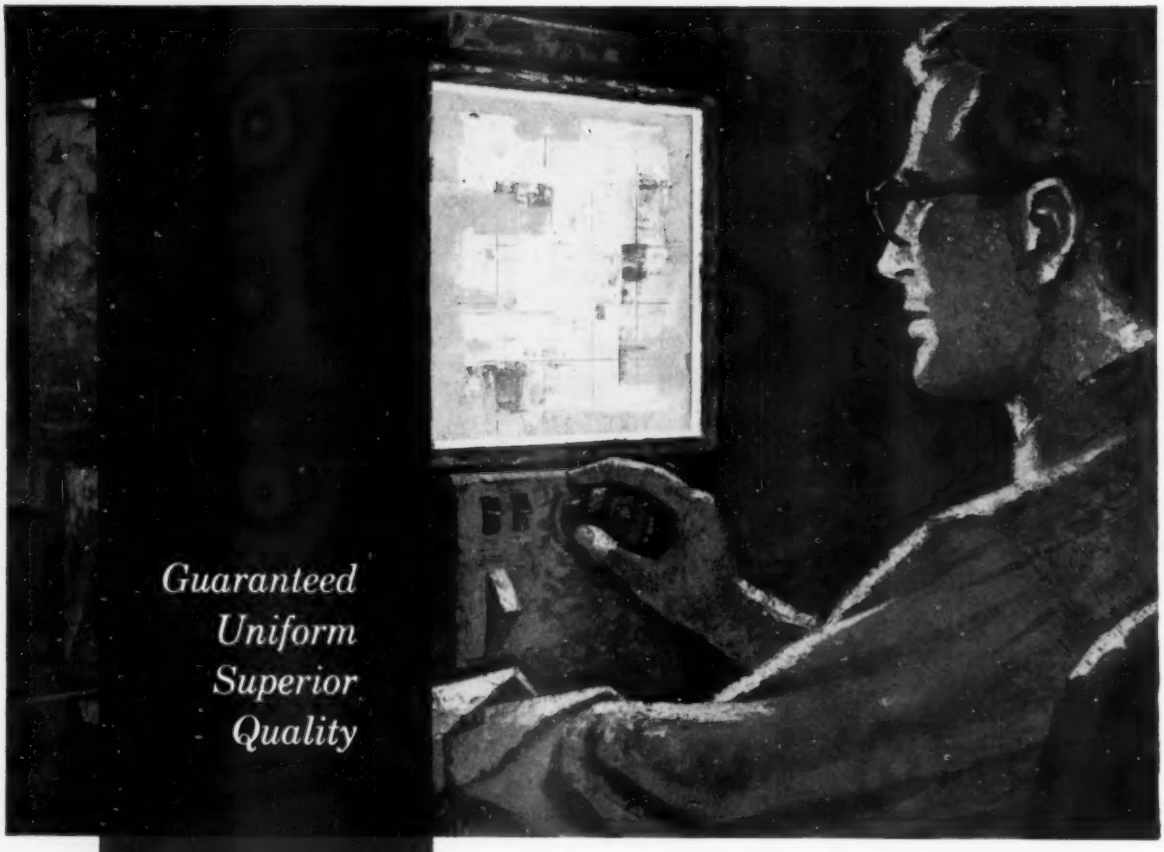

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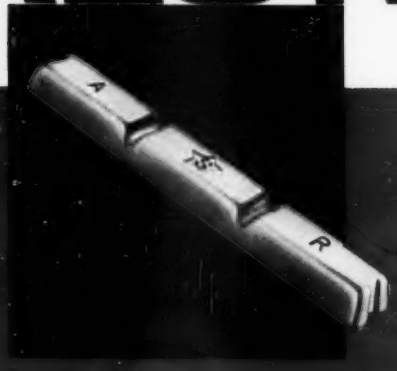

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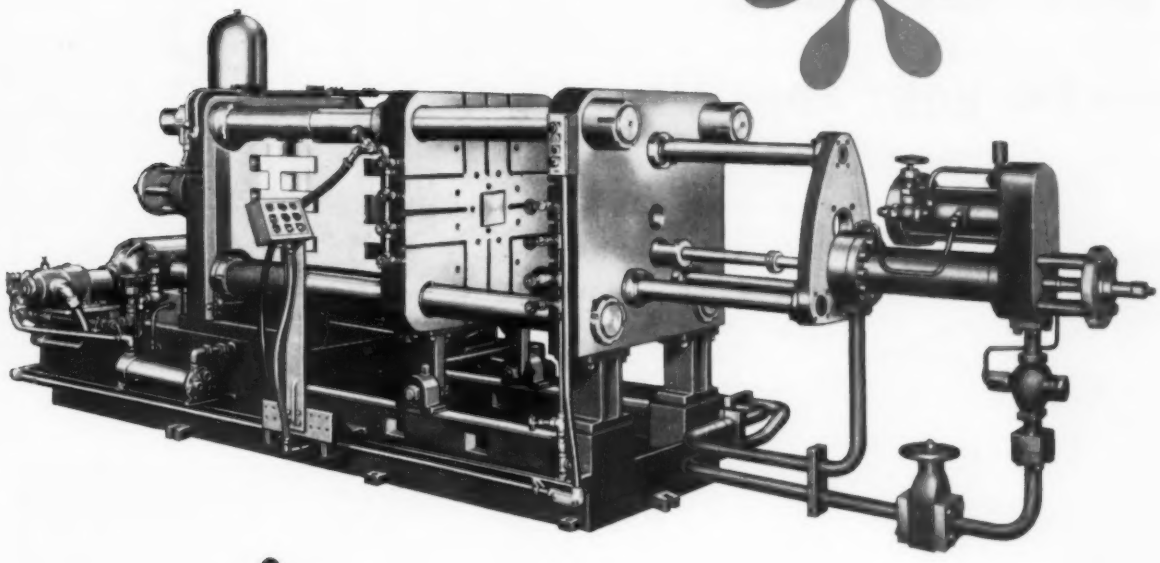

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Die Stroke	Min. Max.	9 15
Locking Pressure (tons)		500
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Injection Cyl. Stroke (Adj.)		14 to 19½
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PMM **IN THIS ISSUE** September, 1959: Volume 17 Number 9

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4 more cost-cutting examples of P-E ALUMINUM Extrusioneering

Here are more examples of P-E Aluminum Extrusioneering. All angles, flutes and varying thicknesses required for each piece are produced in a single operation without machining. Each design offers inherent advantages of greater strength in less weight and the plus benefits of a durable, non-corrosive finish. As indicated, the experience of P-E engineers provides invaluable aid in the functional design of extruded shapes which effect substantial savings in manufacturing costs.

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Precision Metal Molding

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THE INDUSTRIAL PUBLISHING CORP.

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SUBSCRIPTIONS in U.S. and possessions: $7, 1 year; $12, 2 years. Canada: $8 per year. Foreign: $10 per year, payable in advance in U.S. funds. U.K.: £3.5.0 per year payable in Sterling to London office. Single copies, when available: 1 to 10 — 75¢ each; 11 to 25 60¢ each; over 25 45¢ each.

AFFILIATED PUBLICATIONS: Applied Hydraulics & Pneumatics, The Refrigeration & Air Conditioning Business, Material Handling Engineering (formerly Flow), Material Handling Illustrated, Modern Office Procedures, Occupational Hazards, Power Transmission Design, Welding Design & Fabrication, Welding Illustrated. Member BPA.

Accepted as a controlled circulation publication at St. Joseph, Michigan. Not responsible for unsolicited editorial material. Please return Forms 3579 to 812 Huron Rd., Cleveland 15, Ohio.

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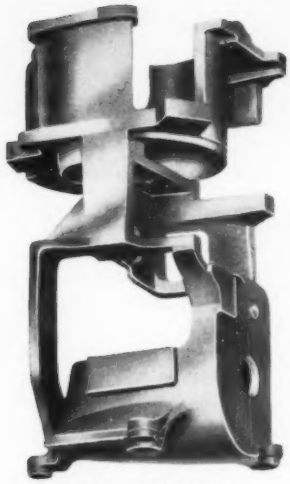

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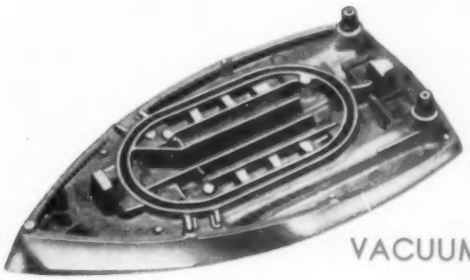

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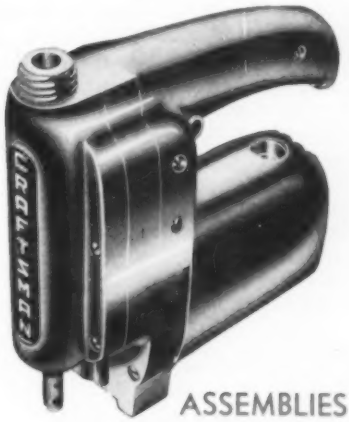

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LETTERS

the readers' forum

BOOK SOURCES

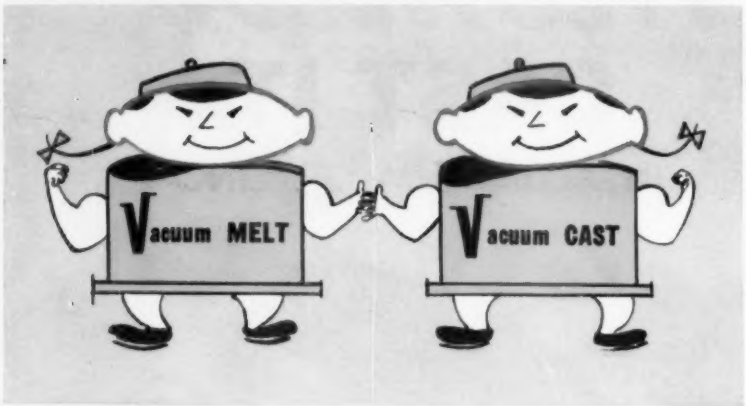
In your August, 1958 issue in the book review section, you noted the book *The Solidification of Castings* by R. W. Ruddle. Will you please notify us as to where we could obtain this book? – D.D.S.

The publisher is the Institute of Metals, 17 Belgrave Square, London SW1, England. – ed.

PLASTIC MOLDING

Please send me any literature you have on the design of plastic injection, compression, and transfer molds. – S.S.

We have no literature available on this subject. A good source is Modern Plastics *magazine. The one book we know about on this subject is;* Moulds for Plastics, *by W. M. Halliday. Write to Temple Press Ltd., Bowling Green Lane, London, E.C.1, England for copies. Incidentally, this book contains a little information about moulds for pressure die casting also. – ed.*



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BOOKS ON DIE CASTING

In the June issue you refered to a list of books on die casting. Will you send me a copy of this list. – G.S.

There are a lot of references to die casting and short descriptions of the die casting process in many of the engineering handbooks. Also separate books dealing exclusively with die casting are:

Die Casting, *by Herman Doehler – McGraw Hill Publishing Co.*

Die Casting, *by Chas. O. Herb – The Industrial Press.*

The Die Casting Process, *by H. K. Barton – The MacMillan Co. (This book is on British practice).*

Moulds for Plastics, *by W. M. Halliday – The Temple Press Ltd., London. (Small amounts of material). – ed.*

CERAMIC MAGNETS

As manufacturers of clutches and brake lining, we are interested in ceramic permanent magnets and would like to obtain more information on the subject. – C.A.V. (France)

We don't have much information on this subject. A letter to the Metal Powder Industries Federation, 60 E. 42nd St., New York should get you all of material you need. – ed.

COLOR ANODIZING

In the March, 1959 issue of PRECISION METAL MOLDING, pg. 32, there was an article on an aluminum die casting alloy for color anodizing. We would appreciate your forwarding us a copy of this article.

A copy of the article has been sent. This is an alloy developed, and patented, in England. We have seen no samples of the anodized die castings yet.–ed.

YOUR CHOICE

I have been receiving the Western Edition of PMM. We are on the eastern side of the Rocky Mountains and I don't know any present or future clients who buy from the west coast if they can get service eastward. – C.C.R. Consultant (Texas).

What's the kick, Charlie? You get a choice that 20,000 other readers don't get. – ed.

continued on page 119

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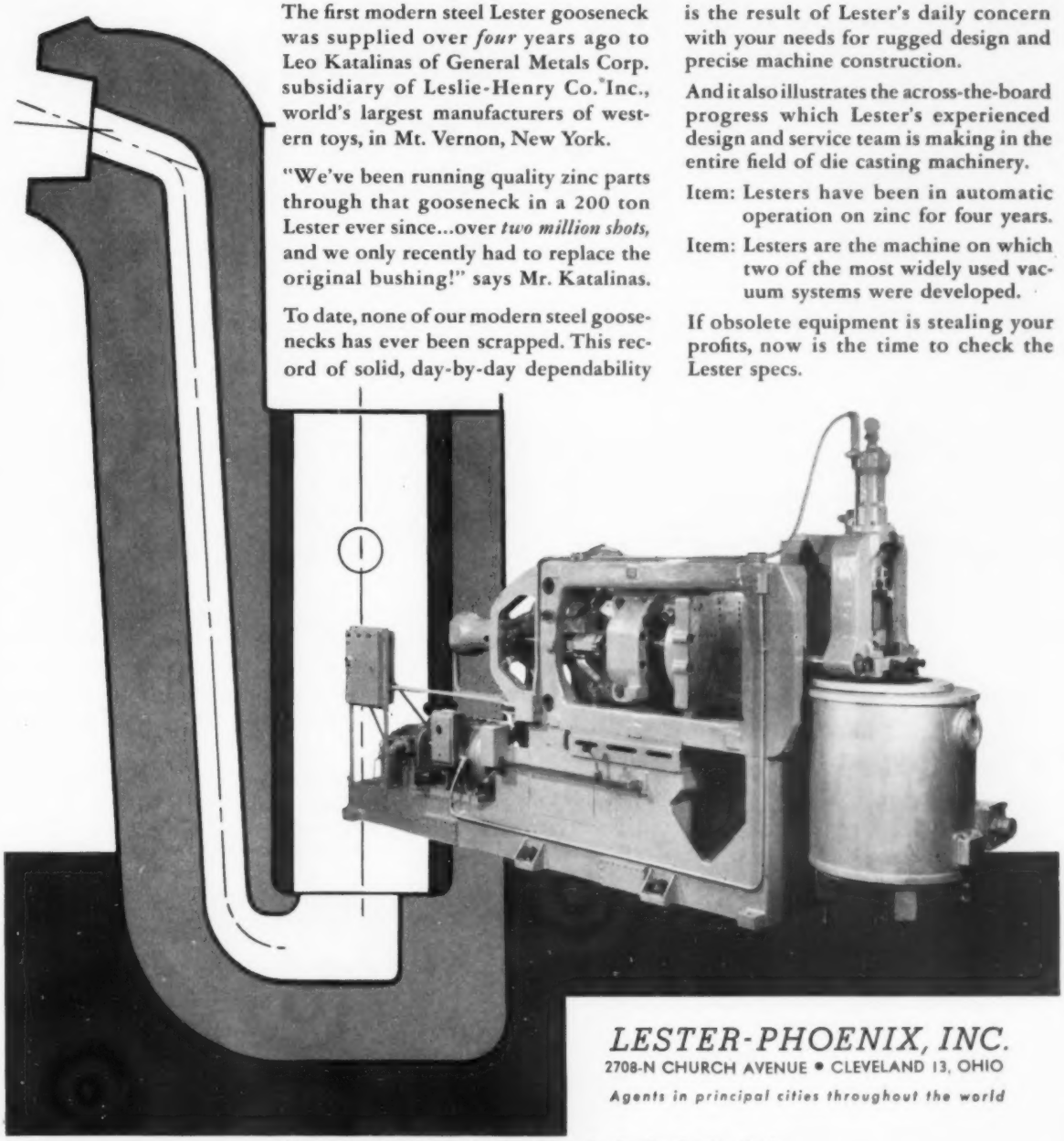

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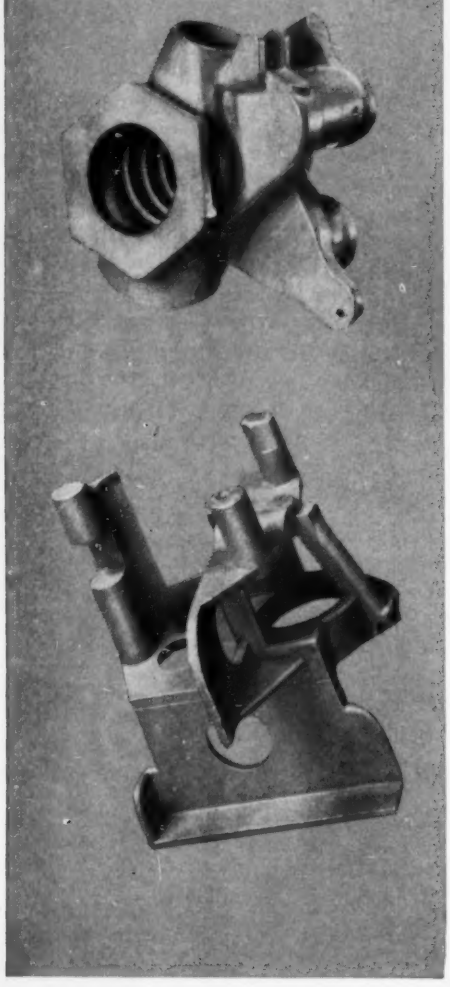

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When you can't simplify the part any more without sacrificing function...

When the production people tell you it will be too costly to machine...

When you think you could cut production costs by making several parts as a single piece...

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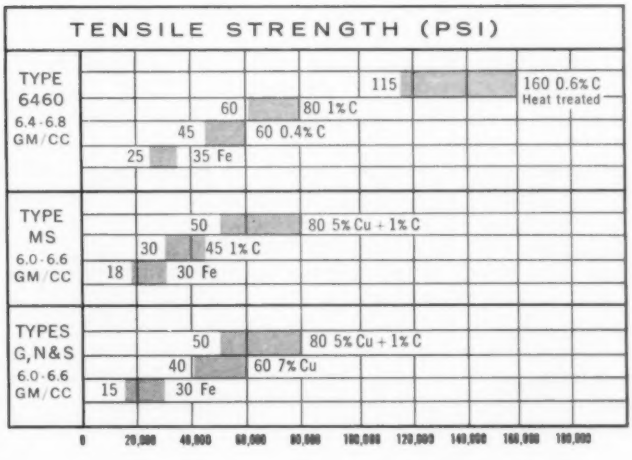

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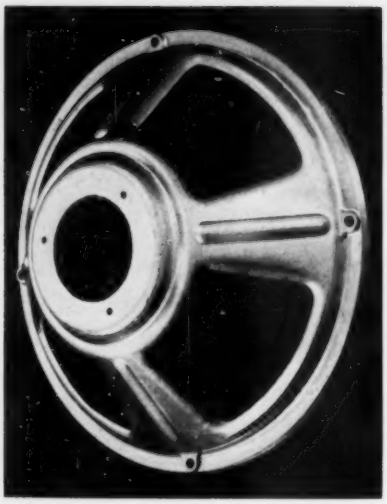

This hi-fi speaker frame illustrates many of the outstanding characteristics found in permanent mold castings. Among them are rigidity, a must for a structural part such as this. Close tolerances, which must be held on the overall diameter of the frame. No machining, all of the holes are cast in the part.

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BETWEEN THE LINES

The editor's viewpoint on articles in current and forthcoming issues

WITH THIS ISSUE we present our eighth annual die casting forecast issue. Each year we have tried to make this issue more informative and more valuable than any of its predecessors. Some of the new data and information you will find this year includes:

A tabulation of the number of die casting machines now in operation. This is broken down in to type of machine, type of shop, and average shop sizes. (Page 48)

An expanded section on the activity of the tool and die shops with special emphasis on the northeastern industrial segment of the country. (Page 42)

A greatly expanded research report. This includes the first full scale report on the newly formed Expanded Research Program of the zinc industry. (Page 38)

A special report from Detroit on the prospects for the die casting industry, most particularly for zinc die castings, in the 1960 model cars. (Page 51)

A report on the uses and markets for fire-resistant hydraulic fluids. This is the first report on this market since 1954. (Page 49)

The editors hope that all of our readers will find this issue of interest and value. Certainly, your comments, whether good or bad, will be welcomed. Also, if there's information you want and which we failed to put in, let us know and we'll try for it next year.

BUT SEPTEMBER ISN'T the only outstanding issue for you. In October the theme of the entire issue will be how to design for lower cost production. Labor is expensive, and liable to get more so, particularly if the steel union wins in current negotiations with the producing companies. That means the designer and the production man must be continually hunting for better and less expensive ways to make products. What's more, you can bet that management is going to start breathing down the neck of engineering to redesign for lower cost production.

The growth and development of all of the PMM processes has come about largely because they cut manufacturing costs. So watch for the examples of cost cutting ideas in the October issue; they will help you.

COINCIDENT WITH THE Metal Show in Chicago, PRECISION METAL MOLDING will publish a highly informative series of articles on the extrusion process. Extrusion, the youngest member of the PMM family of processes, is probably one of the fastest growing metal forming methods in common use today. How extrusions are made, good purchasing practices, outstanding uses of extrusions, what metals can be extruded, and what sort of equipment is used for extrusion of metals.

In addition to this outstanding feature, there will be informative articles on our other processes. For example, an article on the metallurgy of die castable and permanent mold castable aluminum alloys; a discussion of shell type molds for investment castings; a paper on the iron-carbon system in powder metallurgy; and many others. This will be another issue you'll want for your permanent library.

continued on page 82

For better die casting dies...

VDC

Type H-13

HOT WORK STEEL

Here's the air hardening hot work steel that gives service *plus* for zinc, aluminum and magnesium die casting die requirements. Its sound internal structure and freedom from porosity guarantees dependability regardless of shape and size of die.

VDC is easy to machine . . . responds uniformly to heat treatment! These factors lead to die production at new low economies.

Performance-wise VDC's high chromium and vanadium content imparts excellent production characteristics, emphasizing resistance to impact, wash, heat checking!

Local stocks ready for prompt delivery!

Latrobe's network of conveniently located branch warehouses regularly stocks VDC in a wide range of sizes. These local warehouse stocks are backed by Latrobe's time-table mill-to-warehouse delivery system . . . our warehouse processing equipment guarantees prompt delivery of the size you need *when* you need it.

A VDC warehouse stock list is available from your nearest Latrobe office . . . call today!

or send for VDC data sheet

Profit now through faster die production and longer runs . . .
Call Latrobe and specify VDC for your next die casting die!

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Metalmasters for Industry

LATROBE STEEL COMPANY

LATROBE, PENNSYLVANIA

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ANNOUN

(FIRESAFE)

PYDRAUL

Pydraul: Monsanto T. M., Reg. U. S. Pat. Off.

New low-cost all-synthetic hydraulic fluid

CING

A-200

New Pydraul A-200 is the most fire-resistant synthetic hydraulic fluid you can use! It protects expensive hydraulic equipment with "built-in" antirust, even when there's water in the system! It is stable—can be used year after year with no loss of lubricating properties or firesafety!

You can add A-200 as "make-up" to your present all-synthetic fluid system. If you are using petroleum or water-based fluids, a few simple conversions set you up to run on Pydraul A-200. And you no longer need compromise on water-based hydraulic fluids because of price. Pydraul A-200 gives you all the performance of premium oils PLUS firesafety PLUS lower cost!

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Please send me ( ) copies of the Pydraul A-200 booklet.

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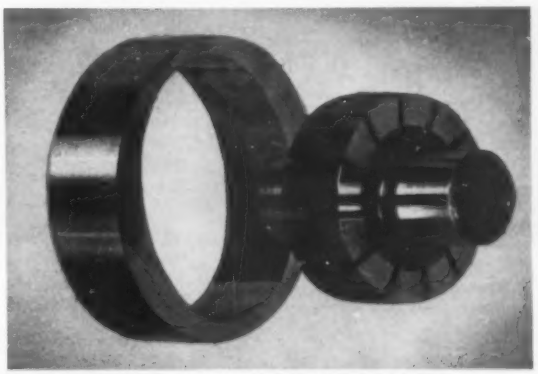
MAXIMUM FIRE PROTECTION

Pydraul A-200 won't flash or ignite—even when sprayed through the flame of an oxyacetylene torch.* Chemically "built-in" fire-resistance safeguards equipment, plant and personnel. And unlike other less expensive fluids, Pydraul A-200 leakage creates no fire hazard—there is no water to evaporate away, leaving flammable residues on walls, floors and ceilings.

*AMS-3150B high-pressure ignition test



CUTS WEAR AND MAINTENANCE

Pydraul A-200 lubricates like finest petroleum oils, resists "abuse" better than other fire-resistant fluids, minimizes down time. Example: Vickers pump ring (above) shows only 0.031 g. wear after severe 1000-hour test.

STOPS CORROSION BEFORE IT STARTS

Pydraul A-200 won't rust metals, eliminates electrolytic corrosion. Perfect score on rust test (above) proves Pydraul A-200 *protects* metal surfaces, even if water gets in the system!

For More information circle No. 115 on the Reader Service Card

CASTING ABOUT

technical news of applications & processes involving precision metal moldings

A 50,000-TON PRESS was needed to forge this beryllium billet into a saucer shaped piece. It's part of the man-in-orbit space project. When all finishing and inspection operations are completed the part will be shipped to McDonnell Aircraft Corp., and will be worth more than $28,000.

A RECORD SIZED BILLET made by powder metallurgical methods was forged into a space vehicle "heat sink." The billet was made by the Brush Beryllium Co. by hot pressing, in a vacuum, about 1000 lbs. of beryllium powder. It was 62 inches in diameter and about 5 inches thick as pressed and rough machined. Then the big piece moved to the heavy press forging plant at Alcoa in Cleveland where it was press forged to about 80 inches in diameter by 3 inches thick, and saucer shaped. Forging was done at 2000°F in steel dies made of H-13 hot work die steel which weighed 30,000 lbs. The dies were preheated to 800° to 900°F.

The forged part will go back to Brush Beryllium in Cleveland for final machining into a saucer 74 inches in diameter by 1 inch thick.

During forging the beryllium was protected from oxidation by a low carbon steel jacket about ½ inch thick. After forging and machining the heat sink will be ultrasonicly inspected and then shipped to McDonnell Aircraft Corp.

REYNOLDS METALS CO. recently put into operation the first of three pot lines in its new Massena, N.Y. reduction plant. Each pot line line will have 167 individual smelters. When all lines are in operation, Reynolds will have a record production level of about 700,000 tons of aluminum.

Present indications are that about one-third of the total production of the new plant will go to the new Chevrolet aluminum foundry now nearing

continued on page 16

FIRST OF THREE pot lines to be started at the new Reynolds Aluminum plant near Messina, N.Y. Production will be 33,000 tons annually from each line. About one-third of the production will go to Chevrolet.

SEE CLEVELAND'S
New Development Center

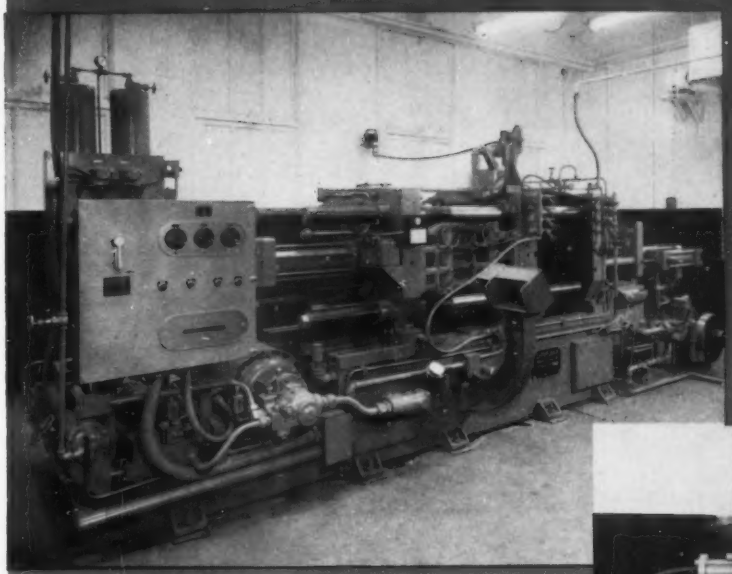
For Advanced Engineering in

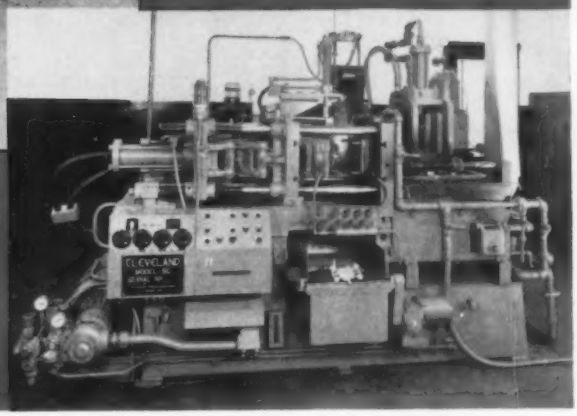
PRODUCING CASTINGS ENTIRELY AUTOMATICALLY

and

LOW-COST VACUUM DIE CASTING

(MORTON SYSTEM)





In Cleveland's Die Casting Development Center are a fully automated 50-ton Cleveland (right) producing a multiple-cavity zinc casting on an around-the-clock, 7-second casting cycle, and a 400-ton Cleveland (above) that incorporates vacuum die evacuation and advanced features for aluminum die casting.

Extensive work in Cleveland's Die Casting Development Center has produced the industry's most advanced engineering of **vacuum die evacuation** and **full automation.*** Equally important, these developments carry **most modest price tags!**

**Other important die casting development work is in progress*

Shown above are a Cleveland Model 50 Zinc Machine and a Model 400-N Aluminum Machine that incorporate these and many other advanced engineering features. These two machines are now in operation in our plant. Call in a Cleveland field engineer. Let him provide you with full details and schedule your visit to see these machines in action.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

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Cincinnati 12, Ohio

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Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

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METAL PUMPING SERVICES INC.

Pumps for Zinc alloy and Aluminum

Metal Pumping Services Inc.

Box 3991, Cleveland 20, Ohio

PHONE SW 1-6160

For more information circle No. 116 on the Reader Service Card

CASTING ABOUT

continued from page 14

completion. Trucks equipped with special transfer ladles will pick up metal for transport from the reduction plant to the casting plant. The metal will be at 1780°F when loaded and can be retained in liquid form in the ladles for several hours if necessary.

TO SOLVE A TOUGH PROBLEM, improvement in the properties of wrought zinc, the AZI's Expanded Research Program has turned to powder metallurgy for help. The project will try to develop wrought zinc alloys with improved mechanical properties through the technique of interference hardening. This can best be done through powder metallurgy rather than through molten metal methods. According to Schrade Radke, director of AZI research, it has been demonstrated that uniformly fine grain size can be obtained by starting with powders. In addition, other metals have been strengthened by introducing a fine dispersion of an insoluble second phase in the metallic matrix.

The powder metallurgy research will be under the direct supervision of Dr. F. V. Lenel, professor of metallurgical engineering, Rensselaer Polytechnic Institute.

A NEW APPLICATION for some metal powders may result from research at Battelle Memorial Institute. Lead-cemented alloys are being investigated by Drs. Williams, Houck, and Jaffee. Lead is effective in shielding for gamma rays. With boron added the resulting material would also stop neutrons thus giving effective shielding in nuclear work.

The improved hardness of the lead, due to the non-soluble dispersion of powder in it, gives additional structural strength which may lead to new uses where both strength and corrosion resistance are important.

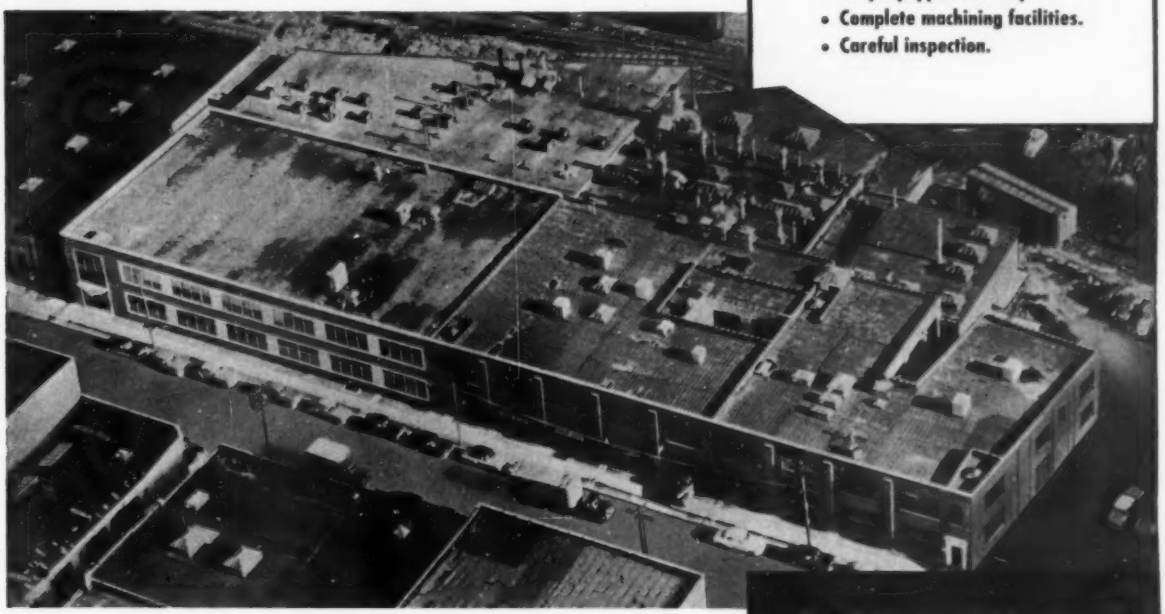
So far, six metals have been found particularly well suited for the new alloys: cobalt, copper, iron, molybdenum, nickel, and tungsten. Early experiments show that the size and shape of the metal powder particles, as well as the amount, affect the final material.

"Service – Quality – Price" take on New meaning

when backed by these extensive, modern

DOLLIN
DIE-CASTING FACILITIES

- Big, modern plant.
- High-production equipment—36 die-casting machines, many fully automatic.
- Trained personnel — 300 employees.
- Experienced engineers for consultation.
- Fully equipped die shop.
- Complete machining facilities.
- Careful inspection.



Dollin Service means more than meeting delivery schedules—it begins with the die-casting print or problem. Can the design be improved, simplified—made more practical—lighter—stronger—lower in cost? Can machining, finishing and assembly costs be reduced?

Dollin Quality means die-casting that have sound structure, clean surfaces, accurate dimensions, fidelity of design.

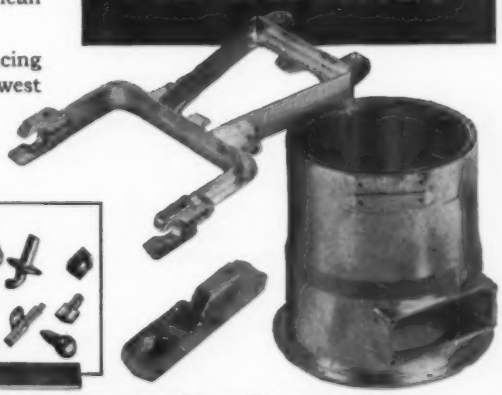
Dollin Price means concentrating our entire facilities on producing the best possible die-casting for your application, at the lowest possible cost.

Submit prints or samples of parts for engineering advice and quotation, without obligation.

DOLLIN

Zinc and Aluminum

DIE-CASTINGS



Complete range of sizes from "Midget" to Large Parts

Large aluminum and zinc castings made on latest-design, high production machines. Small aluminum and zinc castings made in sizes down to fractions of an ounce.

WRITE for 16-page Facilities Brochure. Illustrates and describes complete Dollin services, facilities and equipment.

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See "Yellow Pages" for nearest office.

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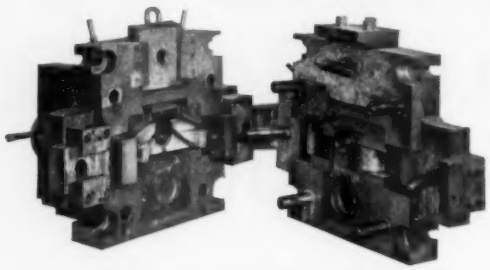

CROMO-HIGH V

a "long-run" grade for die-casters

Many die-casters know from experience that they can count on long production runs when they use Cromo-High V Tool Steel. And this is true whether you're casting zinc, aluminum, or magnesium.

Cromo-High V—Bethlehem's 5 pct chrome-moly tool steel with 1 pct vanadium—provides fine die-casting service because of its extra toughness, and resistance to wash and erosion. It is made by a controlled melting procedure, and has good center density and grain refinement. It is uniformly annealed for ease in machining, and is free from porosity.

Moreover, Cromo-High V is ultrasonic-tested for quality. It responds readily to heat-treatment, and permits uniform heat-treatment in massive sections to a hardness of Rockwell C45-47.

These are all good reasons for using Cromo-High V in your toughest die-casting jobs. Your Bethlehem tool steel distributor has Cromo-High V in stock, and can get it to you quickly. Call him now.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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BETHLEHEM STEEL

BETHLEHEM STEEL

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after 30 years of serving the die casting industry in finishing we **NOW** offer you a complete die casting service

SEND FOR FREE BOOKLET

Take a tour of our modern plant by means of this well-illustrated booklet that shows our facilities for making and plating your die castings.

THE DISALLE PLATING & DIE CASTING CO, INC.
2851 SOUTH AVENUE • TOLEDO 9, OHIO

I am interested in learning more about your ability to produce and finish die castings for me. Please send me your photographic booklet showing your complete facilities without obligation.

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Company _____

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How To Design Excess Labor *Out* Of Your Product with MADISON-KIPP zinc and aluminum die castings

Please ask a traffic officer to open a Magee-Hale Park-O-Meter for you. Inside of this product you will see a prime example of the maximum utilization of the die casting process.

The skilled and cost-conscious mechanics at Madison-Kipp worked closely with the meter designers to attain both excellence of appearance and low secondary labor content.

Please clip this ad as a reminder to contact us when you have die casting requirements.

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MADISON-KIPP CORPORATION
213 Waubesa Street • Madison 10, Wisconsin

• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering
• Originators of Really High Speed Air Tools

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- Complete Design and Engineering Service

- Modern Plant and Equipment

- Highly Skilled Moldmakers

- Over 100 Men to Serve You

Your Product Deserves...

ATOLS

Ultra-Precision MOLDS

We are proud to have won recognition as one of the leaders in this highly specialized field — serving the Die-Casting and Plastics Industries. For more than 25 years, our facilities and services have been utilized by an ever-increasing list of blue-chip companies. We cordially invite you to take advantage of our facilities, our know-how, our reputation for precision-made molds — promptly delivered and economically priced.

ATOLS TOOL and MOLD CORPORATION

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"thank you ... for my husband's life"!

"If Mel had used oil (which is commonly employed) in the hydraulic lines he would have been enveloped by a blazing inferno! But thank God! *Houghto-Safe* was in the lines!"

"Mel was standing here at time of 'blow-up'." Fluid still dripping from lines when photo was taken.

Pump with Houghto-Safe fill tag. Faulty fitting was at right of motor.

DO YOUR MEN HAVE THIS PROTECTION?

Why take chances in your own shop, if men are working around hot metal, open flames, or other high temperature hazards? Even under low pressures, hydraulic fluid can spray up to 40 feet if a line breaks. You need Houghto-Safe protection! And with Houghto-Safe protection, you get top hydraulic efficiency and better-than-ever protection against pump wear.

Now's the time to protect your plant and personnel from disastrous explosions and fire. Call your Houghton Man today. Or write E. F. Houghton & Co., 303 W. Lehigh Ave., Phila. 33, Pa.

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a product of

E. F. HOUGHTON & CO.

PHILADELPHIA • CHICAGO • DETROIT • SAN FRANCISCO • TORONTO

Ready to give you on-the-job service

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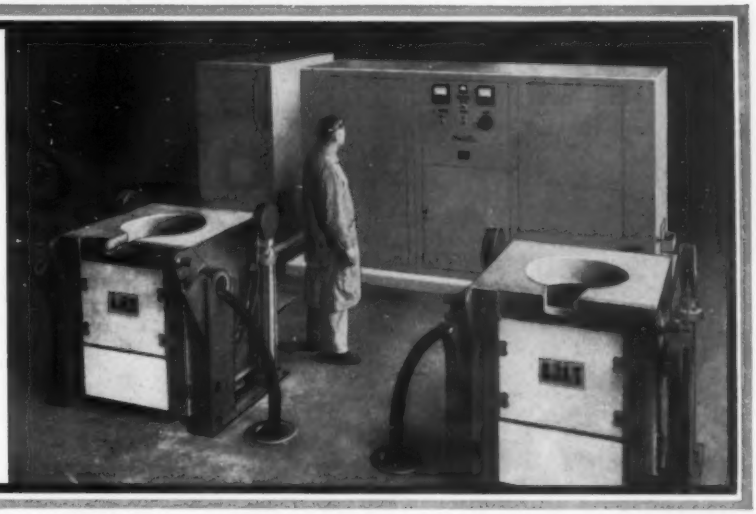
NOW INDUCTION MELTING COSTS LESS THAN EVER...

through
new
Multiductor*
power



*Trademark

* LESS INITIAL COST—The initial cost of a typical Multiductor is less than conventional motor generator type equipment. Further, because the unit is shipped completely assembled and wired, installation costs are drastically reduced. Multiductor requires minimum floor space and uses standard 3-phase, 60-cycle power from ordinary sources.

* LESS OPERATING COST—Operation is so nearly automatic that inexperienced hands quickly become expert operators. Output can be varied continuously . . . while under load . . . from zero to maximum with easy-to-use controls. Damage by overload is practically impossible.

* LESS MAINTENANCE—Multiductor is essentially a static frequency converter. It contains no rotating parts, nothing to wear out, and little to maintain. The number of heats per refractory lining has maintained an unusually high average, going as high as 400 heats with some alloys.

* LESS MATERIAL COST—The strong electromagnetic stirring action of Multiductor powered furnaces promotes rapid melting and diffusion of alloying elements with extremely low metal loss . . . is ideally suited for melting low cost scrap such as borings, turnings, and chips.

* SEE A DEMONSTRATION—Discover for yourself why more and more foundries—at least an additional one each week—are finding that Multiductor Powered Induction Furnaces are one of the greatest melting economizers in history . . . on small furnaces as well as 10-ton units. Write Ajax Electrothermic for a demonstration or an engineer's visit without obligation. Data bulletins are also available.

Induction Heating is our ONLY Business

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Trenton 7, New Jersey

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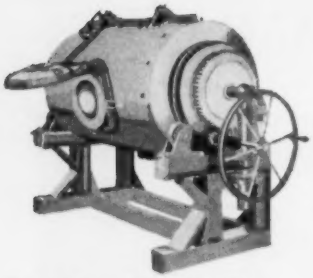
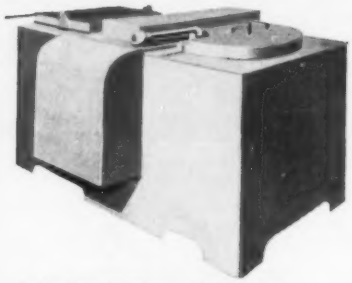
Wherever industry needs heat . . . There's LINDBERG equipment just right for the specific job

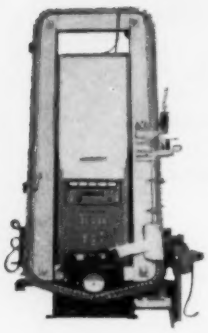


Rotary Open-Flame Smelting Furnaces: Lindberg-Fisher Simplex (shown) either oil or gas fired with capacities to 30,000 lbs. brass, 2,400 lbs. aluminum.

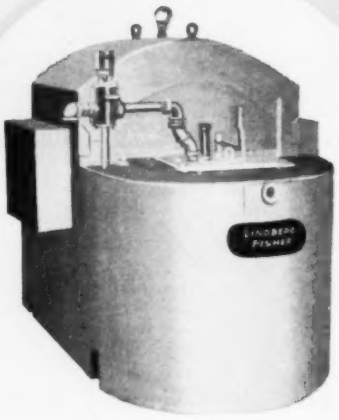
Automatic Ladling Units: The Autoladle "Little Joe". The first practical automatic aluminum ladling unit yet devised.



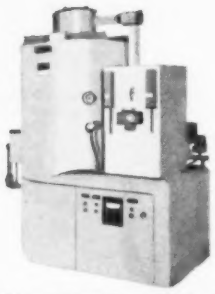
Induction Melting and Holding Furnaces: Lindberg-Fisher two-chamber furnace (shown) melts in one chamber, holds at correct temperature in other.



High Frequency Units: Vertically designed, completely automatic "HF" unit (Shown) for aluminizing automotive valves.



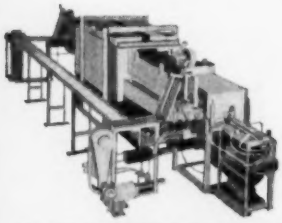
Melting and Holding Furnaces: Electric resistance furnace (shown) with capacities of 750 lbs. to 1500 lbs.



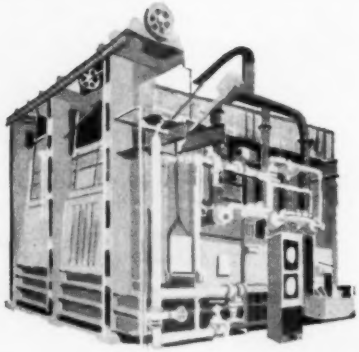
Atmosphere Generators: Hyen generator (shown) for endothermic atmospheres. Generators for all required atmospheres.

Pilot Plant Equipment: Atmosphere tube unit (shown) for ceramic research and development at temperatures up to 2750° F.

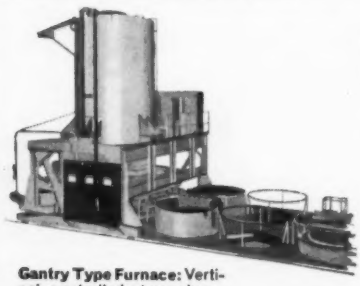
Cyclone Tempering Furnaces: Batch type fuel-fired tempering furnace (shown). Famous in metal treating industry for years.



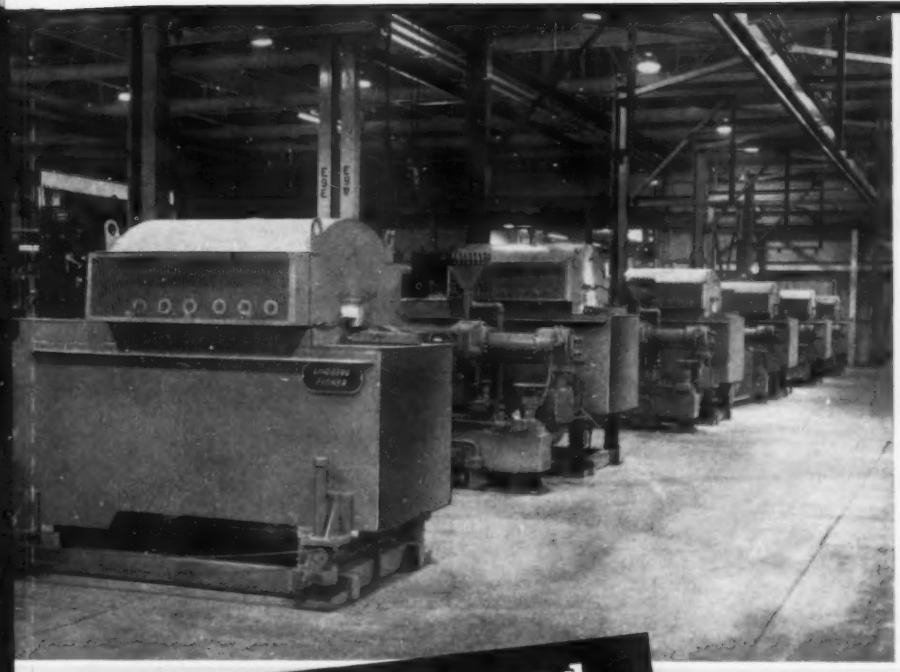
Ceramic Kilns: Fully automatic, atmosphere controlled kiln (shown) has 5 control zones for flexibility. Maximum temperature, 2700° F.



Aluminum Reverberatory Furnaces: Twin-chamber melting and holding furnace (shown) with 45,000 lbs. capacity.



Gantry Type Furnace: Vertical, controlled-atmosphere, drop bottom, hardening furnace. Complete installation field-installed by Lindberg.



Lindberg-Designed

furnaces, more than 75 of them, help Ford Motor Company maintain casting production and quality standards

The new Aluminum Castings Plant of Ford Motor Company, Engine and Foundry Division, at Sheffield, Alabama, is a model of modern production efficiency. Contributing to its effective operation is a huge battery of Lindberg-Fisher aluminum holding furnaces, more than 75 of them. Eight large 65,000 lb. capacity reverberatory holding furnaces receive molten aluminum delivered from an adjacent Reynolds Metals plant and hold it at the desired temperature. Six other reverberatory furnaces, each with 20,000 lb. capacity, are used for remelting scrap aluminum from trimmed parts and holding metal at its usable temperatures. Molten metal is then delivered to more than 60 electric resistance holding furnaces in the casting area as needed. This unique installation, developed by Ford engineers in conjunction with Lindberg, is a major factor in maintaining the high quality product and production standards required by Ford.

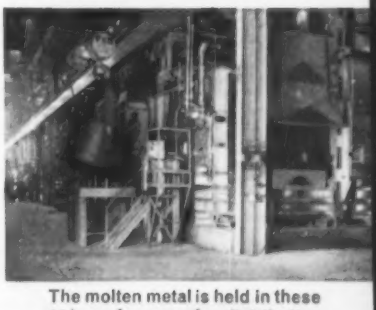
Lindberg equipment and Lindberg planning can help you find the most effective answer to any problem of applying heat to industry. We cover the field, melting and holding, heat treating, tempering, brazing, enameling furnaces, ceramic kilns, high frequency units, and are in the ideal position to recommend just the type of equipment most suitable for your needs. This can be factory built or field-installed in your own plant, fuel-fired or electric. Consult your local Lindberg Field Representative (see the classified phone book) or get in touch with us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2463 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California.

Handsome entrance to new plant of Ford Motor Company, Sheffield, Alabama.

Metal temperatures are positively controlled through Lindberg Control Panel.

Some furnaces are arranged for hand ladling and others are equipped with Lindberg Auto-ladle.

Molten aluminum is delivered direct to reverberatory holding furnaces.



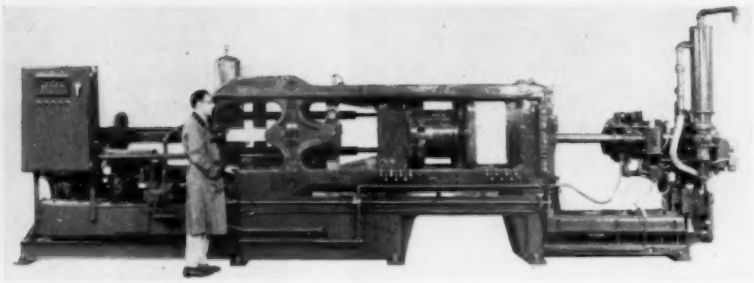
The molten metal is held in these 14 huge furnaces for distribution to the casting areas.

LINDBERG heat for industry

For more information circle No. 118 on the Reader Service Card

NEW PRODUCTS AND DEVELOPMENTS

Qualified readers can get complete details on these products. Use the Reader Service Cards. You'll find them facing page 126 of this issue



DEEP DRAW DIE CASTER

Designed by LESTER-PHOENIX for making castings in aluminum which require extra deep draw, this 450 ton die casting machine has a die opening stroke adjustable from 8″ to 30″. Shot size is adequate for parts weighing up to 16 lbs.

Circle No. 235 on Reader Service Card

NEW FIRE-RESISTANT FLUID

A new, water-oil emulsion type of fire-resistant hydraulic fluid has been announced by SUN OIL. Called Sunsafe, the new product has a viscosity index of 130 and can be operated at temperatures up to 150°F. It has good antiwear and antirust characteristics. Pressures up to 2000 psi may be used safely. The oil-water ratio is 60:40. This fluid has been used in vane, gear, and piston type pumps. In the event of hydraulic line failure this fluid will not flash or support combustion when in contact with flame or incandescent material. It has no harmful effect on packings, seals, hoses or painted surfaces.

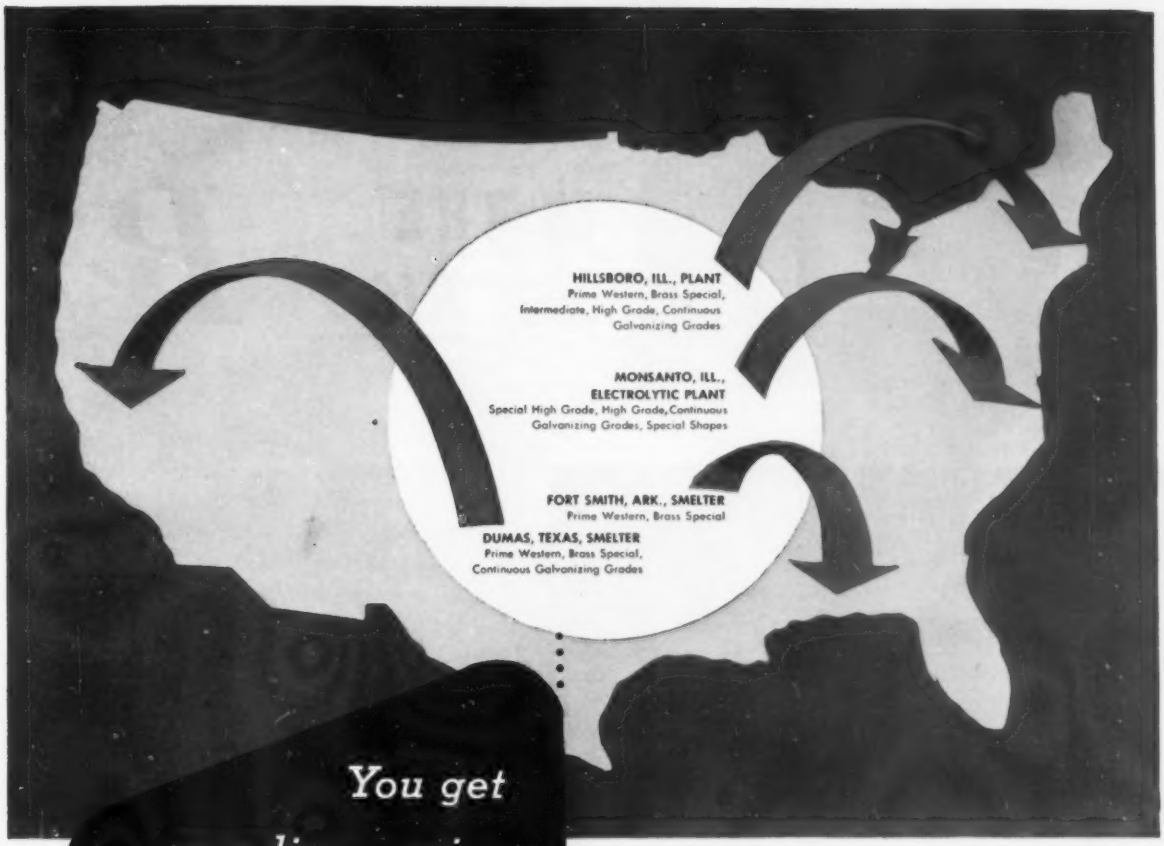
Circle No. 236 on Reader Service Card

FOR VACUUM HEAT-TREATING

A new furnace for vacuum heat-treating at temperatures up to 1850°F has been introduced by the F. J. STOKES CORP. The furnace features a constant temperature zone 12″ long and 10″ in diameter designed by Trent, Inc. The blank off pressure in the retort is less than 0.01 micron and in-leakage is less than 10 microns per hour at 1 micron pressure. Heat control at all temperatures is within 1%. For rapid cooling, the entire furnace may be lowered clear of the retort.

Circle No. 237 on Reader Service Card

continued on page 97


HILLSBORO, ILL., PLANT
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Special High Grade, High Grade, Continuous Galvanizing Grades, Special Shapes
FORT SMITH, ARK., SMELTER
Prime Western, Brass Special
DUMAS, TEXAS, SMELTER
Prime Western, Brass Special, Continuous Galvanizing Grades

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For more information circle No. 8 on the Reader Service Card

They Prescribed *Al* . . .

BUT Zn IS THE *RIGHT* Rx

Nine zinc die castings make up the greater part of this aspirin dispenser. As a result, the mechanism is dependable, durable, and resistant to atmospheric conditions found anywhere.

All slot machines have one common denominator. While manufacturing costs should be low, coin in the slot dispensers must "deliver the goods"—faithfully and consistently. This pre-supposes that the mechanism be durable enough to withstand the wear and tear of constant handling by people, not all of whom are gentle. It is not surprising therefore, to find that most of the working parts of such dispensers are die cast. The aspirin dispenser shown at left is typical. Inside the housing sections are two multi-barreled containers which hold the capsules of aspirin tablets. Each of these segments is approximately 4" long and contains 15 tubes. The two container castings must match exactly to insure smooth feeding of the contents across the joint.

Originally the parts were designed as aluminum die castings. The change to zinc was necessary because of the inability of the die casters consulted to produce the multi-barreled storage sections with sufficiently straight sides so that boring operations could be eliminated. As precision-cast in zinc only the simplest machine work is needed to finish the parts. A few holes are drilled to accommodate self-tapping screws, and a slot cut in the bottom storage section to accept the delivery mechanism. Had these parts been made by any other method, many more—and costly—operations would have been necessary to finish them.

DIECASTING is the Process . . . ZINC, the Metal

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dispersions digest

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'dag' and 'Prodag' are trademarks registered in the U. S. Patent Office by Acheson Industries, Inc.

MUELLER BRASS SAVES $15,000 A YEAR ON FORGING LUBRICATION

Efficiencies realized by just one company — with the help of Acheson Dispersions — have already added up to this substantial savings. Uniform coverage, easy sprayability, and lasting lubrication effectiveness are providing this leading forgings producer: longer die life, increased production, fewer rejects, and improved forgings. This lubricating success story is being repeated throughout the metal working industry. Possibly *you* could profit from the use of an Acheson Dispersion.

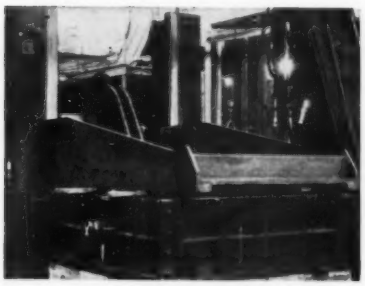
'Prodag' application on forging presses at Mueller Brass Company has saved between $15,000 and $17,000 annually for the past fifteen years. These impressive savings earned by this Port Huron, Michigan company — the world's largest producer of brass and bronze forgings — have been realized in many areas.

Previously, crank forging pressmen at Mueller swabbed the dies between each press stroke. Mueller designed their own spray apparatus, both manual and automatic, to lubricate lower and upper dies simultaneously. Time studies have shown that spraying has effected a five percent-per-pound economy over the swab method.

Spray application of 'Prodag' at Mueller Brass Company has resulted in impressive production savings.

Even more importantly, by using Acheson's 'Prodag' — a dispersion of graphite and water — diluted 1:35, Mueller has gained longer die life, reduced the percentage of scrap loss, and has obtained a better finish on their forgings. According to Mr. O. M. Hanton, Chief Forging Engineer for Mueller, "with 'Prodag' we get the right amount of lubricant on the die. Swabbing resulted in too much lubrication at one place or another in the die cavity, resulting in either a ruptured die or a defective part. Previously, every forging produced had to go to the grinding department. And grinding is one of the most expensive operations in a forge shop."

In producing deep-cavity forgings, or products which demand much smaller tolerances, Mueller uses 'dag' No. 3 — another of Acheson's graphite-water base dispersions. If you have a forging lubrication problem it will pay you to call in your Acheson Service Engineer or write for Bulletin No. 426.



'dag' 35, brush-applied to the slides of this rollover machine, increases machine life for this midwest foundry.

An expensive foundry problem was solved for the D. J. Murray Manufacturing Company, Wausau, Wisconsin, with the use of Acheson's 'dag' 35 — colloidal graphite in an alkyd resin solution. Slides on the huge rollover machine installed in their foundry division, previously lubricated by first a dry graphite and then rosin, were becoming deeply scored as a result of its 90-cycle-a-day operation in the handling of bench and floor molds.

The scoring and machine vibration was so severe that according to Maintenance Foreman, Ben Sayles, "we could see that the life of the machine was going to be very short if we continued this method of lubrication." Coating the slides daily with 'dag' 35, improved machine operation immediately. The scoring all but disappeared. After two years of application with this Acheson dispersion, no repairs have been necessary and none are foreseen. Since the entire production of their grey iron sand slinger line — some 60 tons of material in 8 hours — goes through this machine, the downtime avoided represents an important savings to the company.

For additional information, write for Acheson Bulletin No. 425. Address Dept. PMM-99.

ACHESON *Colloids Company*

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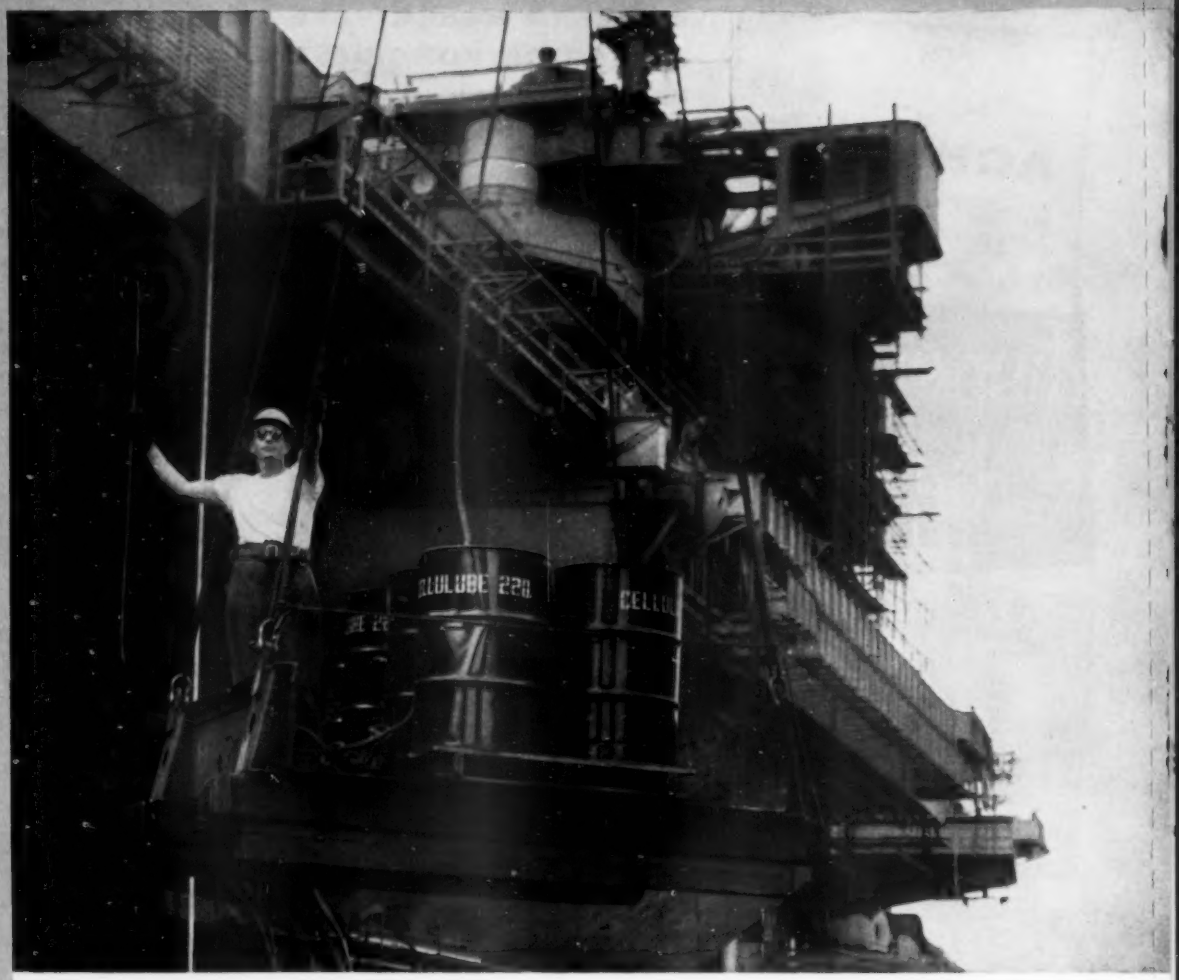
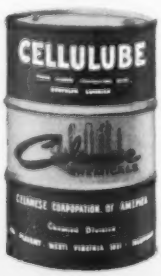


Cellulubes by Celanese shoulder the big jobs . . .

In standard tests, Cellulubes were dripped and flooded onto molten metal at 1500° F without igniting! In a standard flammability test, Cellulubes were sprayed under pressure onto burning oil-soaked cotton waste; they actually extinguished the fire on a portion of the flaming material!

No wonder Cellulubes made by the Celanese Corporation of America are specified for big jobs in hydraulics which present potential fire hazards.



FM

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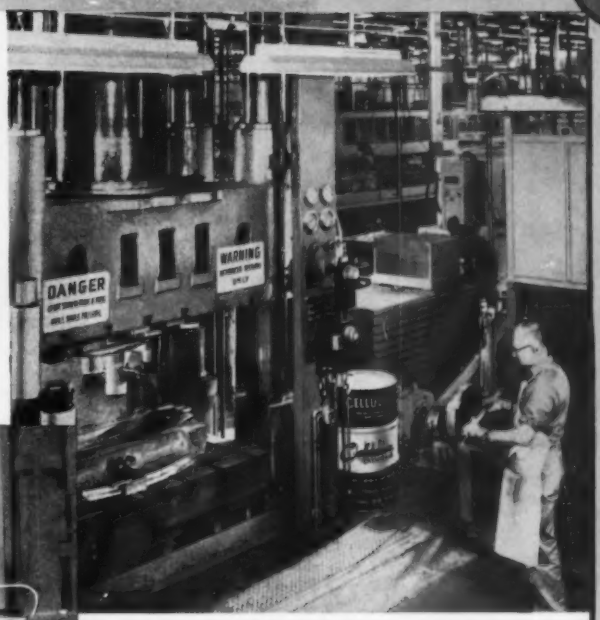
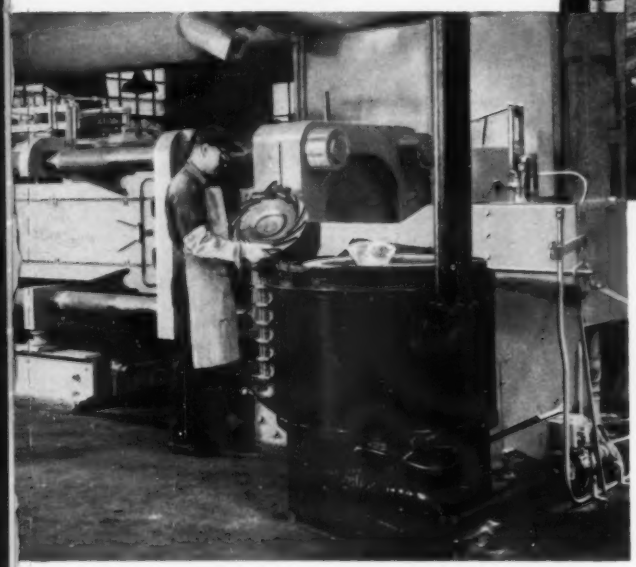
Application I have in mind_____

U.S.S. INDEPENDENCE, the Navy's newest 60,000-ton supercarrier, takes on 55-gallon drums of Cellulube, part of a six-car trainload. Used to operate giant aircraft elevators, Cellulubes overcome the hazard of fire and explosion. Cellulubes are used in the combat fleet for fire-safe hydraulic duty.

TITANIUM PARTS expanded by heating to 1000°F are transferred from an electric furnace to a powerful hydraulic press. North American Aviation uses fire-resistant Cellulube 220 to protect against the dangers of line fracture or leakage during this form-die quenching operation for making high-strength aircraft parts.





DIE-CASTING MACHINES at Alcoa's Garwood plant are hydraulically actuated. Furnace in foreground shows the proximity of the lines to the molten metal. Lines operate at pressures up to 3500 psi. Cellulube hydraulic fluids minimize the danger of fire.

reduce fire hazards near hydraulic machines

Wherever hydraulic lines pass near a source of ignition, fire-resistant Cellulubes are a must.

The fluids are available in six ranges of viscosity, and they maintain these viscosities under the severest conditions of mechanical shear. Cellulubes display excellent physical and chemical stability. They do not foam, cannot drop additives into the system. In fact, they actually have a cleansing action in machinery. Low compressibility insures efficient power transfer. The good lubricant properties of Cellulubes safeguard equipment life and decrease maintenance.

Let us help you with your hydraulic problems wherever a hazard might exist. Celanese, pioneer in fire-resistant functional fluids, can draw on long field experience and research background in solving your problem. For full technical specifications, send for the "Cellulube Safety Series" manual. If you'd like a sample of Cellulube, please let us know what application you have in mind.

Celanese Corporation of America, Chemical Division, 180 Madison Ave., New York 16, N. Y.

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Now, *from stock*, you can obtain longer-lasting *steel* goosenecks* in nominal sleeve sizes for your die casting machines. Dodge goosenecks are machined and sleeved, ready for your use.

Shown here are just a few of the hundreds of Dodge *cast steel goosenecks* we have supplied to industry.

Select the one that fits your machine—then ask us for an eye-opening quotation! If your gooseneck isn't pictured here, ask. Chances are we've made it and it's available. Cast steel replacement parts, from pots to skimmers, are in stock, too.

Write us *today*. We'll be happy to furnish complete details, without obligation.

* *Users report better than 4-year service life!*

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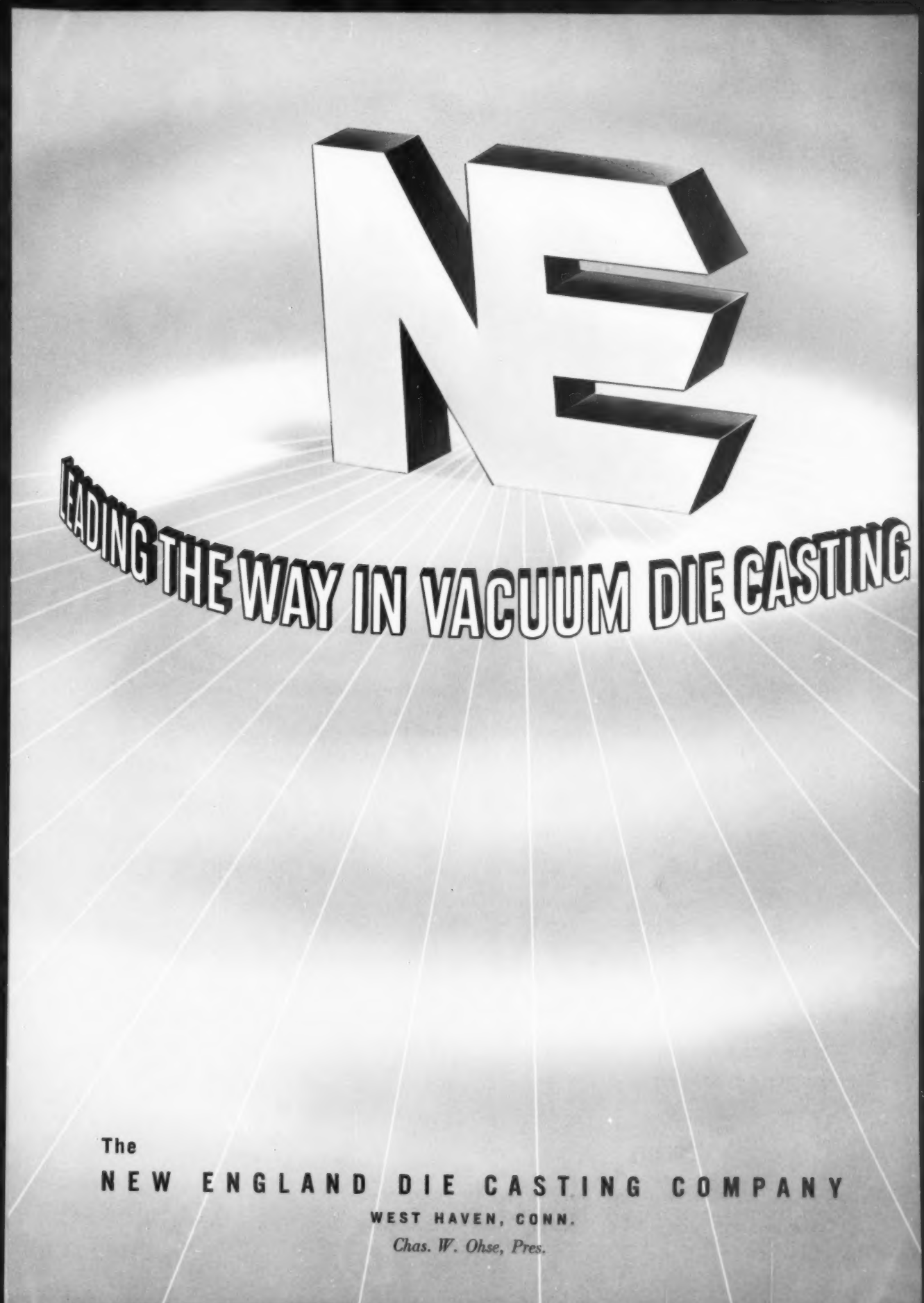

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NEW ENGLAND DIE CASTING COMPANY
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Die Casting and Our Expanding Economy

■ NOSTALGIA is a poor substitute for historical fact. The good old days weren't good. As little as 50 years ago, a majority of the labor force in this country was unskilled labor, at an average hourly wage of 15¢. Today that same worker, or his son, receives an average hourly rate of $1.96. What's even more important, he represents only about 10% of the total labor force. What caused the change? The concept of few goods from many hands was replaced by the idea of many goods from few hands.

Industry, instead of being the devouring monster which fed on men's bodies and souls, has become the primary supporting element of a wealthy and still-expanding economy. The American workman has become a specialist whose economic and social status has climbed as rapidly as his skills. Today, the workman is a new kind of man, living a new kind of life. His most distinguishing characteristic is freedom of choice. His life is his own, to do with as he will. No one tells him where he must work or in what location. No one imposes an arbitrary limit on his progress. No longer can the lot of the workman be likened to a life sentence at hard labor, with bare survival a natural corollary.

But this improvement in the lot of workman has not come without a price. As wages go up and working hours are shortened, the demand for more and more goods arises. To meet the growing demand without increasing the price of commodities, the manufacturer must turn more and more to methods of production which enable him to increase output without adding to his direct labor force. He must turn more and more to methods of production which lend themselves to semi- or full-automation.

To meet the demand for higher production with lower direct labor costs, new industries are being created which take up the slack in employment. But these new industries which have been created are largely those which require highly skilled workers. Thus, there is an ever ascending demand for more goods from more highly-paid skilled workers.

Die casting is one of those industries created by the demand for component parts which are either finished or nearly finished on either fully-automatic or semi-automatic machines.

Continuing research and development work on both machines and metals is steadily broadening the field of application for die cast parts. We now have fully automatic machines which make die castings in either aluminum or zinc. Instead of one operator at each machine, one man can easily tend six or more. Parts which could not be die cast in the past are now in regular production, thanks to the development of vacuum techniques.

Research on die materials has already developed superior materials for core rods, slides, and loose pieces in dies. This same work holds promise for die materials which will make die casting of brasses and bronzes as economically feasible as aluminum and magnesium. New surface finishing methods developed within the last year or two seem to have solved one of the more troublesome problems which faced the wider use of die castings – outdoor corrosion resistance.

The die casting industry is, therefore, making a continuing contribution to our expanding economy. It is a major factor in the American scheme of making more and better goods available to more people who have the highest standard of living the world has ever seen.

And, it's doing it with an ever-decreasing direct labor cost.

P. R. Kalischer

EDITOR

In industry after industry . . .

Die Castings Cut Labor Costs

WHY USE DIE CASTINGS?

Even a casual examination of the two curves shown below gives the answer.

If productivity per man had kept pace with increases in wages, it's possible that the average manufacturer could have produced at a profit by using 1947 methods. But it didn't. Since 1947, average hourly earnings have increased 67%, while productivity per man has increased only 26%.

But failure of the wage and productivity curves to stay parallel isn't the worst part of this picture. Where the trend in wages is continually up, the trend in productivity is down, or at best, leveling off. This can only mean one thing. Unless the price of durable goods is to skyrocket, manufacturers are going to have to turn to methods of manufacture where direct labor charges are far less critical.

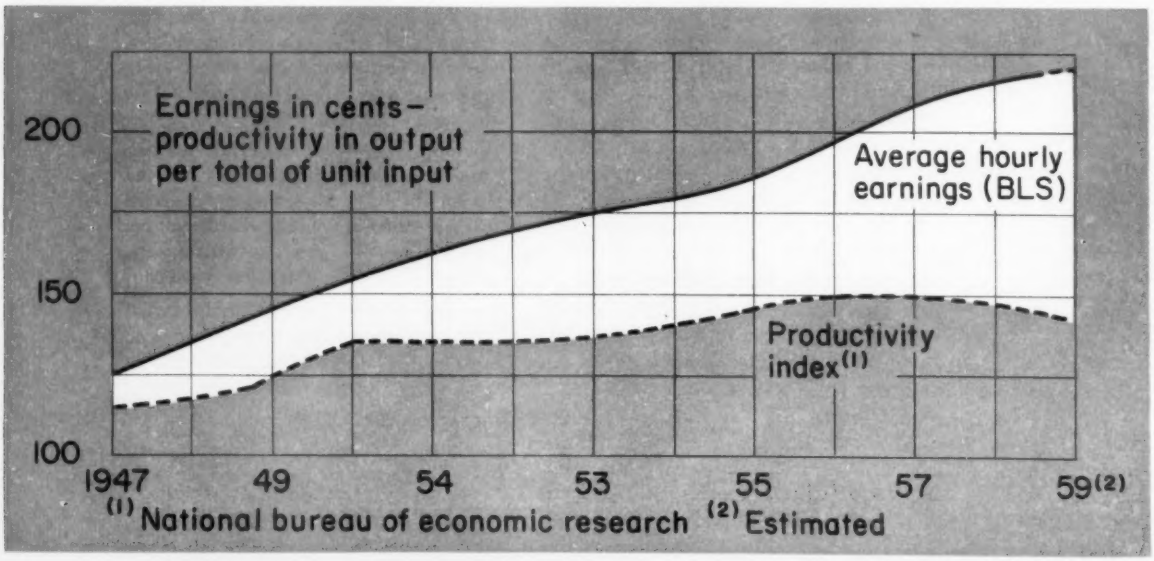
WHAT'S THE ANSWER?

Significantly, the increase in the use of die castings almost parallels the rise in labor costs. In the table on the facing page, we note that American industry has, since 1949, increased its total purchase of die castings 75.9%. The increased usage by individual industrial groups also is given, together with typical examples which illustrate just a fragment of the die cast parts design and production have used to lower costs.

Certainly, die casting is one way to cut manufacturing costs. If a part can be made of a die castable metal, there is no other method of manufacture which can give as nearly a finished product at as low a direct labor cost.

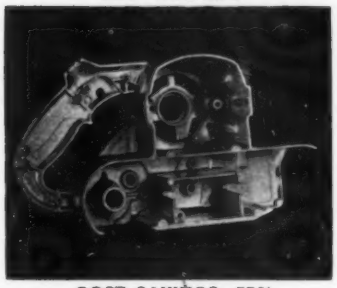
As the reports which follow in this issue show, even greater cost cutting is now, or will be, possible. New and stronger die castable metals are being investigated which will widen the scope of die castable components. New, better, and less costly finishing methods are now available, and others are in the research stage. New die and core rod materials are being developed which may make the die casting of brasses and bronzes economically possible. They may, in the near future, lead to die casting of ferrous metals and alloys. Automatic die casting machines are now on the market; they reduce to 1/5 or less the direct labor charges now involved in making die castings.

The die casting industry and its associated supply industries are dynamic. Designers and production engineers will find that by using the knowledge and ability of the industry they will produce better products at substantially lower manufacturing costs.



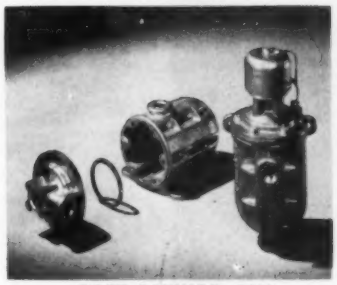
HOURLY WAGES FOR A WORKER ARE RISING MUCH FASTER THAN HIS PRODUCTIVITY.

SAW HOUSING



COST SAVINGS: 55%

FILTER CASE



COST SAVINGS: 36%

SOLENOID HOUSING

COST SAVINGS: 45%

SINK FIXTURE

COST SAVINGS: 75%

DIAL BRIDGE

COST SAVINGS: 63%

TIMING DEVICE

COST SAVINGS: 50%

CAMERA CASE

COST SAVINGS: 31%

DIE CASTING SALES

End-Use Industry Group	1949 (lb)	1958 (lb)	% Increase
Agriculture, Mining & Construction Equipment	3,753,000	12,575,000	235.1
Automotive (Motor Vehicles)	139,400,000	211,295,000	51.6
Other Transportation	4,315,000	8,465,000	96.2
Industrial & Commercial Machinery and Tools	27,899,000	61,770,000	121.4
Electronic Devices & Communications Equipment	6,550,000	8,203,500	25.3
Office Equipment & Business Machines	8,738,000	31,535,000	260.8
Plumbing & Heating & Builders Hardware	14,704,000	35,130,000	139.0
Photographic, Optical, Recording Devices, etc.	12,920,000	23,270,000	80.2
Timing & Time Operated Devices; Clocks	3,500,000	7,380,000	110.8
Home Appliances	77,479,000	126,345,000	63.1
Toys, Sporting Goods, Personal Goods, Jewelry	7,104,000	10,396,500	46.7
National Defense	2,162,000	6,335,000	193.0
TOTAL	308,524,000	542,700,000	75.9

Note: Totals represent all customer die casting sales of aluminum, zinc, magnesium, and brass. Captive use not included.
Source: Reports of members to American Die Casting Institute and U.S. Government data.

JUMPING ROPE HANDLE

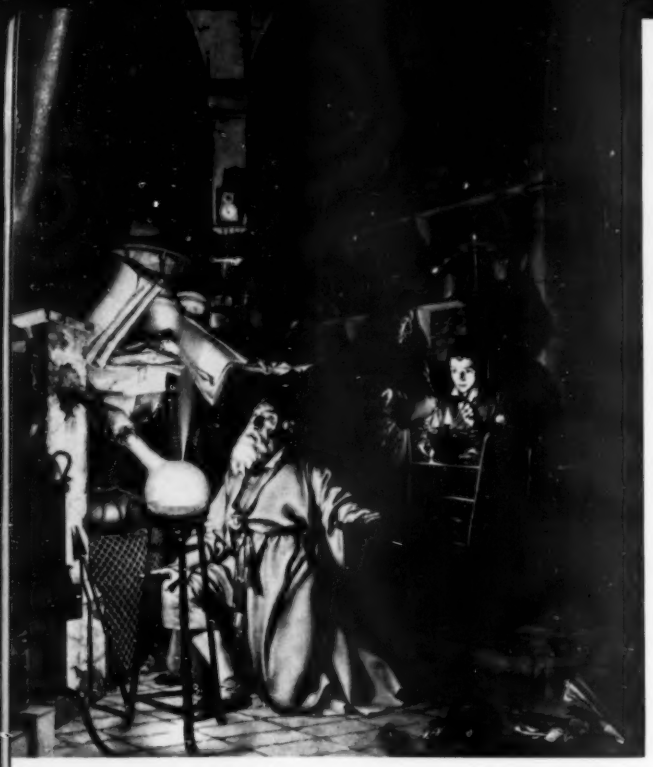
COST SAVINGS: 50%

CARGO LATCH

COST SAVINGS: 67%

HAIR DRYER PART

COST SAVINGS: 50%



Research: Yesterday and Today

THERE HAS ALWAYS BEEN RESEARCH. Our alchemist predecessors may have fumbled blindly. Maybe they were only experimenters with vastly more curiosity than knowledge. Maybe they put too much faith in divine assistance. Certainly, they laid the foundations on which we build today. Their attempts at transmutation of metals certainly were laughable – or were they? We're doing it today and maybe our methods are crude. Maybe we could use a measure of divine guidance.

What does all this have to with die casting? Just this: For many years this industry has been in a relatively fortunate position. The tremendous growth of the automobile and home appliance industries created a market for die castings which made market development virtually unnecessary. The research work was done – no further improvements were needed.

Then trouble started. The increased use of additives in gasoline, more wide spread use of corrosive salts on icy streets, and, above all, the great increase in the number of vehicles on the streets created a corrosive condition never encountered before. The bright chromium plate on zinc die castings failed, and the industry had nothing to offer as a cure.

Why? No research had been done.

Aluminum was offered as an alternate material to chromium-plated zinc. It couldn't be bright anodized, and a buffed and polished aluminum surface did not stay bright. So, here was another market for die castings which was in danger.

Why? No research had been done.

As labor rates continued to soar, and as productivity per manhour lagged, the need for methods of manufacture which eliminated skilled machine and assembly labor became more pressing. Die casting, because it turned out an almost finished part almost automatically, seemed to be the logical answer.

But there were road blocks.

Many of the potential applications required alloys with greater high-temperature strengths than were currently available. Other applications called for superior creep strength and better low-temperature properties. Still other applications demanded far better die life, particularly for aluminum and brass die castings, than present die steels could give.

So here were new markets for the die casting industry which might easily be lost by default.

Why? Not enough research.

Fortunately, some segments of the industry recognized the danger and instituted broad research programs aimed at revitilizing both the die casting industry and its markets. Today, major research is going on which already has given industry improved products, and which promises, in the near future, to let die casting take its proper place in our space age.

The American Die Casting Institute is entering its ninth year of research through its Die Casting Research Foundation. The American Zinc Institute, in association with the Lead Industries Association and zinc producers all over the English-speaking world, has an active research program under way. In corporation laboratories, research into better die materials, more completely automatic production methods, new casting techniques, and new alloy compositions is going on.

Design and production engineers can, therefore, confidently expect that they soon will have new materials, superior tooling, and lower-cost die cast components. Concentrated research and development work, with maybe a seasoning of divine guidance, should open a new era of die casting applications.

Let's look, then, at the reports of research work, both completed and in progress, appearing on the following pages.

EXPANDED RESEARCH FOR ZINC & LEAD

By SCHRADE F. RADTKE*

THE ONLY THING CONSTANT in today's world is change. Man's imagination has left no part of our world or universe untouched. What has brought this about? The answer is research – that incessant quest for knowledge and improvement carried on by a minority group composed of scientists and engineers. They have dramatically changed our world as nothing has ever done before. Never in man's history has one small group caused so much change in our world in so short a time.

The lead and zinc industries felt that, to keep pace and to maintain their place in industry, research efforts had to be stepped up. However, because of the great increase in cost of research and because of the many areas of research which no single company could afford or could justify, a cooperative program was indicated. Under such a program, research of far greater scope and risk can be undertaken without imposing an undue financial burden on any single company.

This program is financed by individual contributions of the zinc and lead producers of the entire English-speaking world, from Tsmueb, Africa, to Australia. Contributions are based on their production of either slab zinc or pig lead. This money is paid into a separate account earmarked for the expanded research program.

During the last year, the research program has reached major proportions, with an open-ended budget of $750,000. While this is an important sum of money, the member companies have agreed that additional funds will be contributed to the program to see that the necessary work is carried out.

Where is this work being done? In existing research organizations, in independent research laboratories, laboratories of the member companies, government laboratories here and abroad, and in universities. In this way, the research is truly international in scope and permits the work to be done in the laboratory most capable of doing it. At present, work is underway in the United States, Canada, Great Britain, Holland, and Australia. An even wider geographical distribution is contemplated.

The results of this research will be beneficial to industry in general, as well as to the lead and zinc industries specifically.

Now let's see what research is under way and what progress has been achieved to date in the field of zinc die casting.

*DIRECTOR OF RESEARCH
AMERICAN ZINC INSTITUTE
LEAD INDUSTRIES ASSOCIATION

NEW FINISHES

Research to improve the corrosion resistance of chromium-plated zinc die castings is being carried out by Battelle Memorial Institute, under the supervision of Mr. Safranek. Work has been in progress since April, 1956, under the present agreement.

Many plating systems have been evaluated during this period, and two appear to produce corrosion resistance which is far superior to industrial chromium plating as it now exists. Test panels have been exposed at two sites, some for over a period of fifteen months, and the superiority of these two systems is apparent. The first of these is called the "duplex nickel process," which is a commercial system in which bright nickel is deposited over dull nickel, affording superior corrosion resistance at areas of local defects in the chromium plating.

The other system approaches this problem from another standpoint, and improved corrosion resistance is predicated on a defect-free chromium plating. This system has been termed "bright, crack-free chromium."

The evaluation of both these methods of improving corrosion resistance of zinc-based die castings has indicated that either method, combined with conventional practice, will produce a far superior product.

Recent work at Battelle has been concerned with determining plating conditions that yield improved, bright, crack-free chromium. The variables of chromic acid concentration, plating temperature, and current density, as well as chromic acid-sulphuric acid ratio, are being studied with respect to continuity of the chromium plate. Information on these variables is desired, to define why some sets of plating conditions are better than others for plating corrosion-protective chromium. It will help guide industry in selecting the best overall plating process.

Future work will be concerned with plating bath variables on the continuity of chromium plate. Investigation of direct nickel plating on zinc die castings is also being studied as a possible means of eliminating cyanide waste disposal problems. Further evaluation of the corrosion protection afforded by duplex nickel, as well as the combination of duplex nickel and bright, crack-free chromium, will be carried out.

IMPROVED ZINC ALLOYS

This program is being carried out in the research laboratories of the New Jersey Zinc Company under the direction of Mr. Anderson and, under the present

continued on next page

PMM FORECAST: RESEARCH *continued*

agreement, will extend until February, 1960.

Work to date has consisted primarily of a literature survey and setting up experimental equipment. The research to be performed will consist of a study of alloys which can be hot chamber die cast, and which may contain aluminum in the range of 5 to 18%. The economic advantages of the hot chamber die casting process have dictated that alloy development be conducted with this process in mind.

Improvement in die casting alloys is sought with regard to higher mechanical properties, wear resistance, creep strength, low temperature ductility, corrosion resistance, and thermoexpansitivity. The zinc-aluminum system seems to be the most likely candidate for improvement of these properties. Wrought zinc-aluminum alloys have excellent ductility and toughness at room temperature, and it is felt that use can be made of these characteristics to achieve the objectives outlined above.

The plan of attack proposed involves proceeding in three major phases: (a) the development of a test bar die suitable for this type of alloy, (b) the preparation of die castings and evaluation of all reasonable alloy compositions, and (c) the more complete study, including the establishment of at least approximate composition limits of any alloys of sufficient interest which may be found. Such aspects as castability, corrosion resistance, platability, physical properties, and mechanical properties of promising alloys will be evaluated.

RESEARCH AIMS AT GREATER EFFICIENCY

By DAVID LAINE*

CONCENTRATED RESEARCH effort during the past 12 months on the part of the Die Casting Research Foundation, an arm of the American Die Casting Institute, has resulted in outstanding developments and in the instigation of specific programs which will have far-reaching effect in further increasing the efficiency of custom die casting production.

When the Die Casting Research Foundation was established by ADCI member companies eight years ago, the objective was to "devote its activities to fundamental programs designed to improve the die casting process and advance its future development as a basic metal working method."

The initial program of the DCRF was the development of improved die materials. It was clearly indicated at the outset that this program involved an exhaustive fundamental study of the physical metallurgy involved. During the past year, the initial phase of this work was completed for the DCRF at Battelle Memorial Institute.

The future, in terms of die casting die developments leading to widening of the fields of application, promises to be most rewarding. This study has developed a basic equation relating the variables of the die casting process to the heat checking of die steels. It's a significant step in advancing the application of die casting techniques to higher melting point alloys.

The original exploration into the area of die materials has led the DCRF into many corollary activities, one of which has been the development of improved core materials. Utilizing the knowledge acquired in screening literally hundreds of possible die materials, it became apparent that molybdenum offered unusual properties as a core material, due to its remarkable resistance to heat checking. Through the cooperative efforts of the Climax Molybdenum Corporation of Michigan in supplying high purity materials and the Universal-Cyclops Steel Company, principal fabricator of molybdenum, in improving working techniques, a molybdenum base alloy has been developed which greatly increases the life of cores in dies producing zinc, aluminum and magnesium die castings (see PRECISION METAL MOLDING, July, 1959; pg. 32). Other benefits include reduction in downtime for polishing and straightening, and lower scrap losses resulting from tears on die casting surfaces.

A new project started during the past year by the Die Casting Research Foundation is a study of the principles of metal flow in die casting dies. It is recognized that many of the variables in die casting production stem from a lack of complete understanding of the behavior of the metal in filling the die cavity. Already a comprehensive review of the available literature on metal flow in dies has been made by a task group of the Foundation. The next step will be the establishment of a full-scale study of the subject. A cooperative project with related research groups to sponsor this program is now under joint consideration.

Many other phases of die casting production are in the competent hands of individual task groups of the DCRF Technical Committee, composed of 34 representatives of 30 custom die casting companies. In-

*SECRETARY
AMERICAN DIE CASTING INSTITUTE

cluded among these activities are the evaluation of commercial vacuum die casting systems, die lubrication problems, die temperature controls, and cast dies and tools. The DCRF Technical Committee also has a task group assigned to cooperative research with the American Zinc Institute.

Another of the recent accomplishments of the Die Casting Research Foundation has been the development of a compatible vacuum die casting method designed to meet the needs of the custom die casting industry. The new vacuum systems can be used on either hot or cold chamber die casting machines.

The development of a compatible vacuum die casting method is an outstanding example of the results obtainable through the Die Casting Research Foundation concept of pooling custom die casting knowledge. This new approach to applying vacuum in die casting is being employed by DCRF participating companies through a licensing arrangement, the proceeds from which will enable the Foundation to further extend its activities to advance the die casting process as a basic metal working method.

DIVERSE EFFORTS PROMISE GREAT DEVELOPMENT

ADCI AND THE ZINC INDUSTRIES are far from being alone in conducting research for better products, better materials, and lower-cost die castings. Many independent firms in different fields are working on projects directly related to die casting. The following are just a few of the more significant ones.

DIE MATERIALS

Molybdenum. An active program on molybdenum die materials is under way at General Electric's plant in Cleveland, Ohio. Die blocks made of pure molybdenum and molybdenum base alloys are being investigated for application in die casting brass. Thus far, the results appear promising. These die blocks are currently being made by powder metallurgical techniques which open alloy and mixture compositions impossible to get with standard pyrometallurgical methods.

Vacuum Melted Steel. In the field of more orthodox die materials, the wider use of vacuum melting in consumable arc furnaces holds some promise for improved die materials. This process gives steel these desirable properties: superior cleanness, better grain structure, lack of segregation, and absence of dissolved and entrapped gases. Thus, we may soon see a group of steels with superior life as die casting dies, with better die surfaces. Probably, however, it will take another year before the necessary evaluation of these steels is completed.

MACHINES

The die casting machine builders are working on improved machines. They recognize that direct labor charges in making die castings must be reduced. At least five companies have these fully automatic machines on, or ready for, the market. All of them are in relatively low tonnage locking pressure, and use either single or multiple cavity dies. Machine speeds, for hot chamber machines, run as high as 1000 free cycles per hour. Most of these machines require operator attention only for inspection and to maintain metal level in the melting or holding pot. All of the machines will stop in the event of any trouble.

METALS

Die castable alloys also have had their share of study. One of the latest to be announced is a new magnesium-thorium alloy developed by the Dow Chemical Co. This alloy, HM11XA, is a high-temperature, high-strength metal which will find expanding use in the space and missile fields (See PRECISION METAL MOLDING, July, 1959; pg. 37).

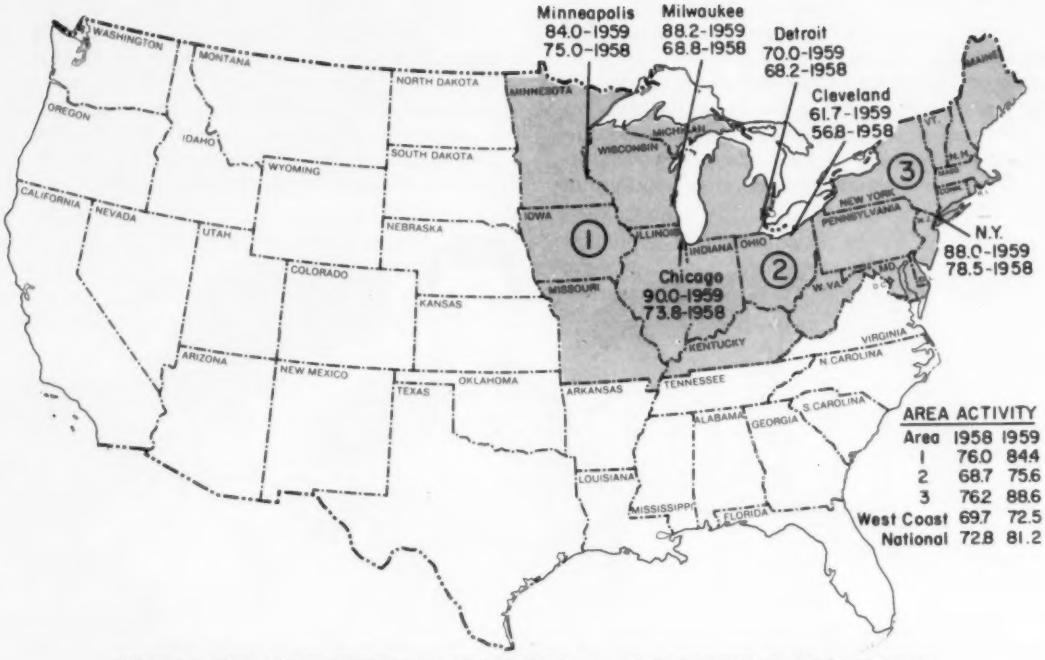


FIGURE 1. TOOL & DIE SHOPS ARE BUSIER NOW (% OF CAPACITY) THAN LAST YEAR.

Tooling activity indicates . . .

Greater Die Casting Production in 1960

WHAT CONSTITUTES A FORECAST? Charts? Statistics? Cycles? Indices? Certainly, a forecast has all of these. But the basic consideration is: How much of his company's money is a man willing to spend to prepare for future business?

With today's high labor rates, almost every industry must use every possible device to reduce direct labor charges. One of the most effective of these is die casting. So, if a product is going to be made in some near future time, and if it is going to enjoy large sales, there's a better than even chance that some of the components will be die cast.

If they are die cast, the tooling must be made well in advance of production. This is where the real forecasting comes in. The businessman who is spending many thousands of dollars for die casting tooling actually is forecasting high future sales of his company's product.

When enough companies do this, there is certainly reasonable assurance that business for the die casting industry will be good for the next several months, because most die castings have to have long runs to justify the high cost of tooling. It follows, then, that IF THE TOOL AND DIE SHOPS ARE BUSY NOW, THE DIE CASTERS WILL BE BUSY IN THE COMING MONTHS.

Are the tool and die shops who make die casting dies busy? PRECISION METAL MOLDING surveyed all the shops who have said they make die casting dies to

find out for which industries they are making dies, and to find out how busy they are.

Here are the results:

The industrial northeastern quarter of the United States only will be considered, since replies from other areas were so few that reliable estimates could not be made. In this industrial area, the response to the questions "At what percentage of capacity is your shop running now?" and "What rate were you running at one year ago?" showed an average operating rate of 81.2% this year against 72.8% of capacity a year ago. This is a gain of 8.4%.

METROPOLITAN BREAKDOWN

This overall survey can be broken down into sections, and into city metropolitan areas, as shown in Figure 1. Both the eastern and western sections are comfortably busy. The die casters in these areas will probably enjoy better business in the coming months than will those in the central section. There, the overall percentage of capacity is at least 10 points below the western section, and some 6 points under the national average. This same condition, to a slightly lesser degree, was true a year ago.

When the tool and die shop activity is broken down into city metropolitan areas, the reason for the poorer showing in the central area becomes more evident. The two major concentrations of this work are in Detroit and Cleveland. Neither of these cities showed a significant improvement over last year (see Figure 1 and Table I). On the other hand, Minneapolis, Milwaukee, Chicago, and New York all showed gains of from 12% to 28%. This difference can be attributed to the strong influence of the automobile industry in the central section, and to the lack of diversification of industry.

INFLUENCE OF OTHER FACTORS

Another factor which must be considered when studying these findings is the average wage paid to machine operators and to tool and die makers. Table II shows the average wage paid in these two categories in selected cities, as reported by the Bureau of Labor Statistics.

The end-use industries for whom the die casting dies are being built is also revealing. From Table III, it is clear that the automobile and appliance industries are the dominant factors in die casting activity. In those cities, however, where tool and die shop activity has shown the greatest gains in the past year, there is a far better balance as to type of work being done.

For the next several months, therefore, it is probable that die casting activity throughout the industrial quarter of the country will be appreciably better than it was last year. In the areas where there is a wide diversification of industry, the improvement will be greater than where one or two types of manufacturing industries are dominant. The gain will probably be the greatest in the Milwaukee area. Chicago will probably be a close second, followed by New York and Minneapolis. Highly industrialized, non-diversified areas such as Detroit and Cleveland will probably make the poorest showing.

TABLE I

Tool & Die Shop Activity in Selected Cities

City	% of cap. 1958	% of cap. 1959	% change in 1959
Chicago	73.8	90.0	+22.0
Cleveland	56.8	61.7	+ 8.6
Detroit	68.2	70.0	+ 2.6
Milwaukee	68.8	88.2	+28.2
Minneapolis	75.0	84.0	+12.0
New York	78.5	88.0	+12.1

TABLE II

Average Hourly Rates for Machine Operators and Tool & Die Makers (Bureau of Labor Statistics)

City	Tool Room Machine Operators	Tool and Die Makers
Chicago	$2.68	$2.92
Cleveland	2.62	2.79
Detroit	2.95	3.03
Milwaukee	2.62	2.91
Minneapolis	2.40	2.64
New York	2.56	2.81

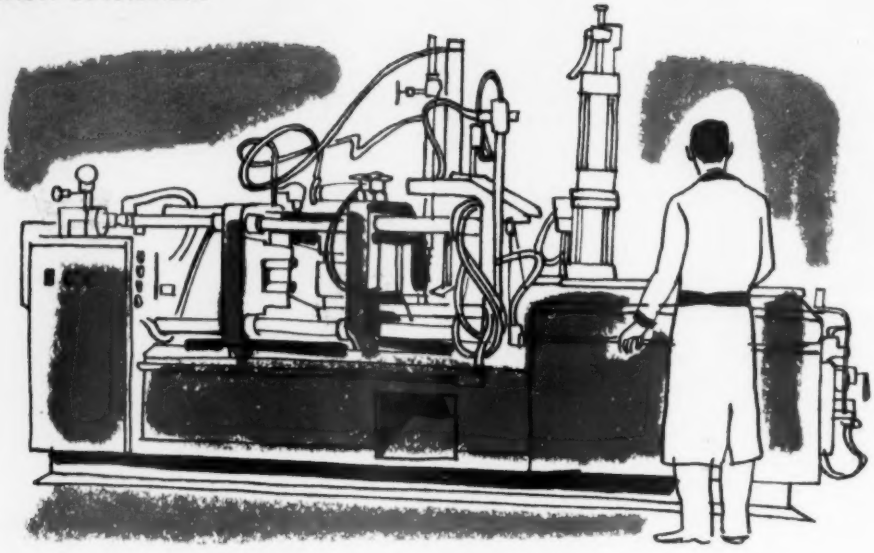
(Note that Cleveland and Detroit are among the highest rate cities)

TABLE III

Percentage of Reporting Shops Who Are Making Dies or Have Them on Order for These Uses

Metropolitan Area	Automotive Uses	Appliance Uses	Consumer Goods	Industrial Goods
Chicago	62.5	100.0	62.5	62.5
Cleveland	76.9	92.3	46.1	61.7
Detroit	100.0	88.2	52.9	29.4
Milwaukee	66.7	100.0	55.6	66.7
Minneapolis	20.0	60.0	20.0	80.0
New York	40.0	70.0	50.0	70.0

The figures given in this table are based on the number of shops reporting, not on the number of dies being built. For example, in Detroit every shop reporting was making dies, or had orders for dies, for automotive end use.



Machinery Sales May Near All-Time High

DURING THE FIRST HALF of 1959, almost as many die casting machines were produced as in all of 1958. If production continues at near the present level — and there's no present indication that it will not — this year and early 1960 should definitely reverse the downward trend in machine production which began about 1956.

Total production for the year should be between 400 and 500 units, with a good possibilty of more than 500 machines. Since 1952, the best year was in 1955, when a reported 541 machines were built. This high is somewhat below actual production figures, since two companies did not report. However, information from other industry sources makes it fairly certain that the 541 figure is not more than 10% low, indicating a maximum of 601 machines.

If this year approaches the all-time high, it would mean a total market of more than $15 million for the industry without including machines rated at over 1000 tons locking pressure. These machines are generally built to customer specifications, so that average selling prices cannot be determined.

Possibly the brightest part of the picture for the die casting machines builder is the definite trend toward fully automatic machines.

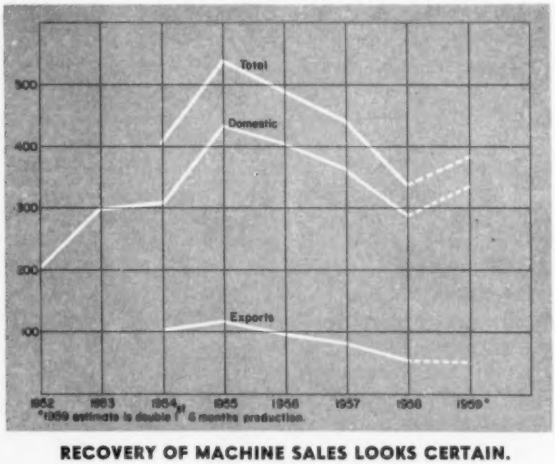
Over the past four or five years, machines rated at under 100 tons locking pressure have outsold any other size by about two to one. Even in 1958, when

TOTAL MACHINE SALES
(Domestic and foreign, hot and cold chamber)

Locking Pressure								1st half
Tons	1952	1953	1954	1955	1956	1957	1958	1959
Under 100	56	65	133	168	206	201	188	71
101 - 250	28	32	57	67	50	28	25	27
251 - 400	43	70	51	86	55	53	29	43
410 - 500	36	49	82	78	37	51	24	13
501 - 750	26	50	80	109	85	71	18	18
751 - 1000	9	20	0	33	33	35	36	15
1501 - 2000	0	0					1	2
Total	198*	286*	403	541	466	439	331	189

*Domestic Sales Only; Foreign Sales Not Available

TOTAL SALES OF ALL TYPES OF MACHINES.



RECOVERY OF MACHINE SALES LOOKS CERTAIN.

DOMESTIC MACHINE SALES

HOT CHAMBER

Locking Pressure Tons	1952	1953	1954	1955	1956	1957	1958	1st half 1959
Under 100	52	64	73	83	111	129	138	57
101 - 250	16	15	15	39	32	8	15	21
251 - 400	5	27	8	32	23	17	19	6
401 - 500	19	22	41	49	22	27	12	0
501 - 750	5	20	20	43	12	3	6	6
751 - 1000	4	4	0	10	20	1	3	2
TOTAL	**101**	**153**	**157**	**256**	**220**	**185**	**193**	**92**

COLD CHAMBER

Under 100	4	1	4	8	14	13	12	3
101 - 250	12	16	19	13	14	9	6	5
251 - 400	38	43	28	39	28	30	9	31
401 - 500	17	27	37	29	12	24	22	9
501 - 750	21	30	57	62	73	66	11	10
751 - 1000	5	16	0	22	11	33	29	13
1501 - 2000							1	2
TOTAL	**97**	**133**	**145**	**173**	**152**	**175**	**90**	**73**
All domestic sales	**198**	**286**	**302**	**429**	**372**	**360**	**283**	**165**

TOTAL DOMESTIC SALES, BY MACHINE TYPE.

FOREIGN MACHINE SALES

HOT CHAMBER

Locking Pressure Tons	1952	1953	1954	1955	1956	1957	1958	1st half 1959
Under 100			45	65	73	52	33	9
101 - 250			12	5	0	3	2	0
251 - 400			5	0	3	5	1	4
401 - 500			2	0	2	0	0	0
501 - 750			0	0	0	0	0	0
751 - 1000			0	0	0	0	1	0
Total			**64**	**70**	**78**	**60**	**37**	**13**

COLD CHAMBER

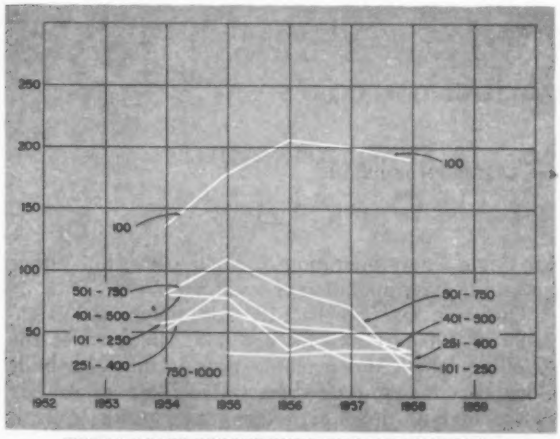
Under 100			11	12	8	7	5	2
101 - 250			11	10	4	8	22	0
251 - 400			10	15	1	1	0	2
401 - 500			2	0	1	0	0	4
501 - 750			3	4	0	2	1	2
751 - 1000			0	1	2	1	3	0
Total			**37**	**42**	**16**	**19**	**11**	**10**
All Foreign Sales			**101**	**112**	**94**	**79**	**48**	**23**

TOTAL FOREIGN SALES, BY MACHINE TYPE.

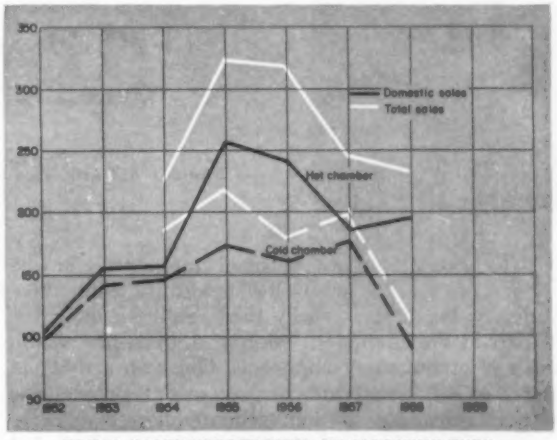
all machine sales were down severely (about 30% for the entire industry), these small machines showed an increase. In fact, they recorded the highest annual sales since 1952, when the first statistics were gathered.

What caused this phenomenal increase? Partly, of course, because these machines are relatively low priced. But more important than price was the introduction by several companies of fully-automatic hot chamber machines. These automatic die casting machines are the result of concerted research and development work by at least three or four of the major companies. These companies set up research and development laboratories to study problems of automation, and came up with a number of fully-automatic machines with rated locking pressures up to about 125 or 150 tons. One man, functioning largely as an inspector, can attend five or six casting machines operating at rates of 500 or more shots per hour and with free cycling speeds up to 1500 cycles per hour. (For the opinions of machine builders on fully-automatic die casting machines, see next page.)

Another factor which is giving the industry a needed boost is the increased emphasis on very large cast parts. From information now available, at least two of the major automobile builders are committed to a cast aluminum engine block. For high production, they will probably be die cast. This will mean machines of about 2000 tons locking pressure and 70 to 90 pound shot capacities. Over the next three to five years, the number of machines of this size will steadily increase, in turn increasing the dollar sales volume of the industry.



TOTAL SALES BREAKDOWN, BY MACHINE SIZE.



TOTAL SALES BREAKDOWN, BY MACHINE TYPE.

WHAT'S AHEAD FOR AUTOMATIC MACHINES?

AUTOMATIC DIE CASTING machines will undoubtedly get a great deal more attention from industry as labor costs continue to rise.

The best sources of information on the development of automatic die casting machines are the men who make them. Here are the opinions of some of them:

". . . trend is . . . toward fully automated operation."

GLENN A. MILLER, Ass't. Sales Manager, THE CLEVELAND AUTOMATIC MACHINE CO.

"About six months to one year ago, we found a growing demand among the automotive equipment manufacturers for a relatively small, fully automatic die casting machine. Originally, this interest was for hot chamber machines to make small and medium-size zinc die castings.

"The original interest seemed to be for a die casting machine which would be fast, operate with inexpensive dies, and eliminate as much labor as possible. The dies which were considered were not always single cavity dies. However, the trend seemed to be toward reducing the number of cavities in a die, thus reducing the cost of the die.

"Now, what is the trend today?

"I would say that the present-day trend is stronger than ever toward fully automated operation. Certainly, the die caster's dream is to have a battery of machines producing castings with as few operators as possible. I think we will see this realized soon.

"Die casting automation need not be limited entirely to hot chamber machines. By attaching a vacuum system to a die casting machine, aluminum can be automatically ladled or metered and production rates of over 300 shots per hour obtained. It does not require much imagination to visualize the addition of low pressure closing, stripping, automatic die lubrication, a water box, a conveyor, and a timed limit switch to make this machine fully automatic."

". . . part of . . . effort to reduce production costs . . ."

DAVID J. SLOANE, Vice President, LESTER-PHOENIX, INC.

"The present interest in small automatic zinc die casting machines is not exclusive with the automotive industry, but it is primarily their requirement and it is part of the continuous effort to reduce production costs of automotive components. Our own activity in this field originated with the automotive people, and is now spreading out into general interest.

"In our experience, these machines are not intended for single cavity operation of small parts, but rather for multi-cavity operation of small parts.

"Our own machine has 125 ton clamp and is capable of 1000 free cycles per hour. Because of the speed at which the machine runs it must be built along very heavy, rugged lines. Field experience has shown that at these high operating speeds, only a first-class piece of equipment will hold up."

"... greater productive efforts per machine."

JAY C. PETTER, Vice President and Chief Engineer, B&T MACHINERY CO.

"There has been a greatly increased demand for small automatic machinery in the past several years. One of the most amazing trends in this field to us has been the change in thinking of the die caster from consideration of small inexpensive light die casting machines with reduced capital investment, to the realization that the small automatic machine should be a relatively expensive, rugged, precision machine with consideration of the smallest detail as to accessibility of electrical, hydraulic, and machine components, coupled with the automated features such as low pressure closing, double ejection, automatic lubrication, safety re-cycle devices, gear-driven motorized die height, and high-speed hydraulic circuits.

"Potentially, with one man running a battery of automatic machines at high speeds, minutes of downtime and maintenance become a large factor in the productive capacity of the equipment. Thus, although there will be a savings in machine investment, these are not as great as originally considered some years ago, but the greater investment will result in greater productive efforts per machine."

"... definite trend ... especially the hot chamber model."

C. E. TAYLOR, President, CAST-MASTER HPM DIV., — KOEHRING CO.

"In regard to relatively small, fully automatic die casting machines, our Cast-Master Div. informs us that there is a definite trend for this type of small machine, especially the hot chamber model.

"These machines are being bought for both single cavity and multiple cavity dies. Indications are that the die casting industry is headed for a higher degree of automation than ever before."

"... automatic machine becomes ... highly-skilled operator."

IRVING HOFFMAN, Sales Manager, DCMT SALES CORP.

"It is becoming more obvious today that the new concept in die casting is for complete automation of the process. A machine to be fully automatic must be capable of performing all of the various operations performed by a die casting operator. It must be built

continued on next page

so that it will run continuously under tough conditions, day in and day out. Such a machine is subject to wear on parts common to all die casting machines, but at high cycling speeds.

"Because the die casting problem is complex enough, it is preferable to avoid multiple cavity dies. To compensate for the lack of productivity secured by multiple cavity dies, the machine must operate at high rates.

"A fully automatic die casting machine must perform all of the operations normally done by the operator and many additional ones. It must be completely fail-safe. It must automatically clean flash from the die faces, have automatic lubrication, thermostatically-controlled metal and die temperatures, accurate automatic ladling, and automatic ejection and gate stripping.

"A fully automatic die casting machine becomes, in effect, an optimum, highly-skilled operator. It is capable of producing the best possible castings under the most precise operating limits. It enables the die casting process to become considerably more competitive with other fully automated manufacturing techniques."

HOW THE AVERAGE SHOP IS EQUIPPED

THE TWO most-frequently asked questions about die casting shops are: What is the size of an average shop? How many machines are now installed?

To get the answers, PRECISION METAL MOLDING questioned the 1350 known die casting installations. Of these, 440 companies replied, representing 32.6% of the total. In this group were shops having only one machine, as well as the largest shops in the country. Here are the findings, projected for the industry:

Total number of machines installed	11,430
Average number of machines per shop	8.46
Jobbing shops	8.91
Captive shops	6.28
Average number of hot chamber machines per shop	4.56
Jobbing shops	4.92
Captive shops	2.85
Average number of cold chamber machines per shop	3.90
Jobbing shops	3.95
Captive shops	3.43
Number of machines equipped for vacuum die castings, all shops	435

(Note: these are divided about 13 to 1, jobbing to captive shops.)

The sample on which figures for the captive shops was based was rather small – less than 20% of the known shops. These figures, while probably accurate, might be questioned.

When the estimates made from this survey are compared with the known sales of die casting machines for the past seven years, we find that about 20% of the die casting machines now installed were sold in that period. Figures for machine sales from 1955 are broken down to show sales to either captive or contract shops. These figures reveal that in the four (and possibly five) years covered, the sales of hot chamber die casting machines to jobbing shops have remained fairly stable, while the sales to captive shops have dropped sharply. Cold chamber machines, however, show a reverse trend (Figure 1).

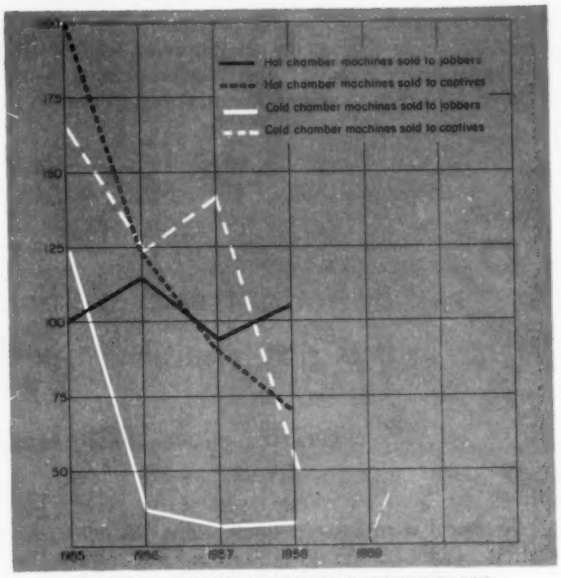


FIGURE 1. DISTRIBUTION OF MACHINE SALES.

One possible explanation of this peculiarity in the machine sales picture is the emergence of the very large captive shops in the automobile and business machine fields. Most of these shops have been aluminum casting installations. While both zinc and aluminum used for die casting have shown steady increases, it would seem that the amount of zinc cast by jobbing shops is steadily increasing, probably indicative of a wider diversification as new applications of die castings are developed by industry. This is probably a healthy condition, since it tends to make the die casting industry less dependent on a single customer – the automobile industry.

BREAKDOWN OF MACHINE SALES

	1955 Job	1955 Captive	1956 Job	1956 Captive	1957 Job	1957 Captive	1958 Job	1958 Captive	1st half 1959 Job	1st half 1959 Captive
Hot Chamber	100	201	114	123	94	90	120	78	48	38
Cold Chamber	127	167	41	124	33	143	35	61	29	54
TOTAL	**227**	**368**	**155**	**247**	**127**	**233**	**155**	**138**	**77**	**92**

Note: Totals in this table are below the total sales reported in the table on page 44, since some companies did not report this sales breakdown.

MACHINE SALES TO JOB AND CAPTIVE SHOPS.

FIRE-RESISTANT FLUID BECOMING NECESSITY

SALES of fire-resistant hydraulic fluids continue good, with the die casting industry the largest single customer for these fluids.

Almost all the larger die casting shops require the use of some sort of non-flammable hydraulic fluid because they realize that a fire can put them out of business quickly and thoroughly.

The required use of fire-resistant fluids is stronger in the captive shops than it is in jobbing shops. This is probably due to more strictly defined and enforced safety regulations, since a majority of these shops are units of large corporations.

There is little doubt that in the coming years more and more large buyers of die castings will require that the jobbing die caster use fire-resistant fluids to eliminate one more possible cause of non-delivery of castings. A step in this direction has already been taken by government procurement agencies who refuse to accept bids from establishments who do not take this safety precaution.

In the accompanying table, the total sales of fire-resistant fluids and the sales to die casting establishments are given. Sales for 1958 were down by about the same amount as the sales of die casting machines, about 32%. Based on first half sales, 1959 is showing a very favorable recovery, up 27% in the first six months. Barring unpredictable business dislocations, sales of these fluids for the balance of 1959 and early 1960 should continue to rise.

SALES OF FIRE RESISTANT HYDRAULIC FLUIDS
(In gallons)

Year	Total Sales	Sales to Die Casting Industry
1954	493,000	329,000
1955	847,000	589,000
1956	1,342,000	899,000
1957	1,497,000	886,000
1958	1,363,000	600,000
1959*	837,000	380,000

*First six months only.
Sales figures are from five reporting companies.

IMPROVED LUBRICANTS WILL DECREASE COSTS

IN MANY CASES, the economic success or failure of a die cast part may depend upon correct lubricant selection. Soldering, improper die fill, poor surface finish, sticking (especially on core rods), and many other casting failures can be directly attributed to the wrong lubricant. The problem is probably most severe with magnesium, least severe with zinc.

All the lubricant manufacturers are doing major research on die lubricants. Considerable progress has been made, and there is ample evidence that new and better materials will be available.

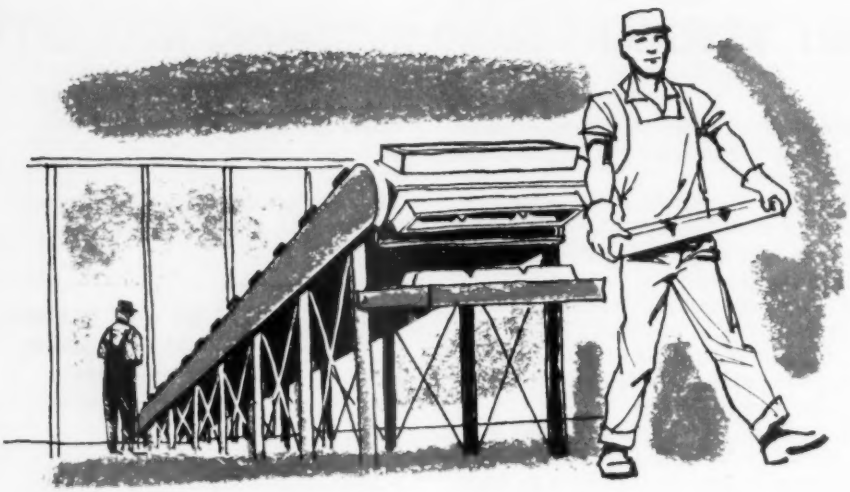
A large part of the problem has been to develop an understanding of how a good lubricant works. Research has shown that the most successful materials are those which fail in shear. Some forms of graphite, some stearates, and many of the sulfides have this characteristic. Their structure is similar to that of mica, so that when the casting is pulled from the die the lamellae separate. A thin film is left on the casting and another film on the die. The life of the lubricant is longer when only a very minute amount sticks on the casting, while the balance remains on the die. This makes the difference between lubricating after every shot or after every three, four, five, or more shots.

As present research learns more about this action, and new materials of proper structure are developed, new and better lubricants will become available. Through them, cycling speeds can be increased, since frequent lubricating will not be needed.

One of the new lubricants which deserves mention is Lubricase. This is a method of die treatment which appears to combine light nitriding of the die surfaces with the controlled formation of a sulfide layer on the casting surfaces. The process was developed in Europe and has only been used experimentally in this country. So far, the results are good. One aluminum die, which had to be repolished after every four or five shots, has run several hundred between polishings after getting this new surface treatment. In another case, a zinc die, four passes under the polishing heads were required to prepare the surface for chromium plating. After die treatment, only two passes were required.

The present method of applying this lubricating surface has one distinct disadvantage. The dies must be removed from the casting machine and sent to specially-equipped heat-treating shops. Whether this trouble will be overcome in the future is uncertain.

Apparently, however, this Lubricase process, or some modification of it, holds out hope for better, cheaper castings which will require less surface-finishing work. (Note: A full scale report on the Lubricase process of surface treatment will appear in an early issue of PRECISION METAL MOLDING.)



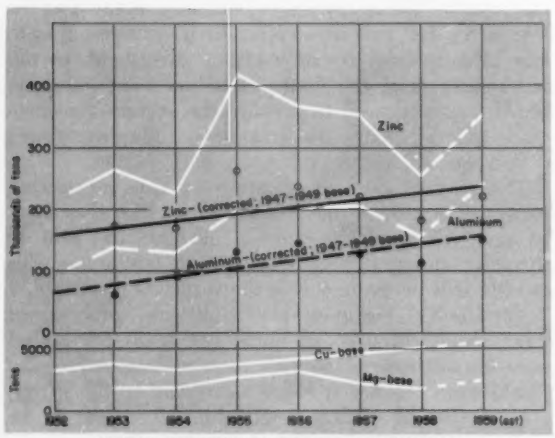
Despite stiff competition . . .

Metal Consumption Continues to Rise

ONE DOESN'T NEED to be clairvoyant to predict good business for the metals producers and refiners in the coming years. Every possible barometer indicates a steadily-rising consumption curve for the die castable metals.

There can, and probably will, be some shifting from metal to metal, depending on economic conditions. However, the steady upward trend shown by the use curves for aluminum, zinc, and magnesium is certain to continue.

Naturally, there are periodic drops in metal use, but these are of short duration – seldom more than one year. These hurt, but mines are not opened nor are refining plants and smelters built as short-term propositions.



METAL CONSUMED FOR DIE CASTINGS.

The metal consumption curves indicate clearly how all the die castable metals are showing a steady, consistent increase in use. This is even more apparent when the actual tonnage consumption figures are corrected for industrial activity. While there is some departure from a uniform increase per year, the trend is clear. In the case of zinc base alloy, there has been an increase from 1952 through 1959 (estimated) of nearly 40%. Aluminum has, of course, shown a much more spectacular gain in this same period, about 143%.

Certainly, there is every reason to believe that the minimum consumption of these metals will continue to follow this same curve. If present research is successful, both zinc and aluminum – particularly zinc – can be expected to show gains over the next few years which are far greater than any safe prediction would indicate.

There will, of course, be serious competition from other materials, notably plastics. For those uses where high mechanical properties are not required, where color is desirable, and where the part does not have to be next to a chromium-plated metal piece, plastics will be considered. New plastics which have just been announced are proposed for such applications as gasoline filter caps, fuel pump bodies, carburetors, and decorative items on automobiles. It's possible that they may be widely used some day, but not while the raw material costs nearly $1.00 a pound.

However, even though the present price per pound is high, and the predictable decrease in price of plas-

tic only 20 or 25%, the metal suppliers and die casters cannot afford to be complacent. No material has a corner on any market. New materials must be watched and evaluated carefully. They eventually will take a portion of the market now enjoyed by die cast metal parts. When they do, the metals industries must already have developed new markets for their products.

But there's plenty of room for optimism, and this feeling is reflected in the opinions of responsible officials of metal suppliers. Here are a few of them:

APEX SMELTING COMPANY

There is evidence of a great increase in the use of aluminum by the automobile companies. Naturally, the "hot metal deals" of two of the big companies eliminates a lot of metal which would normally be supplied by the smelters and primary producers in ingot form. However, the general increase in automotive production and the pick-up in business of the jobbing shops will more than offset this loss.

At this time, we are not concerned about the supply of scrap. For the future, we believe that, within the next 6 to 8 years, junked automobiles will be a gold mine for the smelters.

AMERICAN SMELTING & REFINING COMPANY

The expanded use of aluminum in automobiles will displace some brass and, to that extent, will have an adverse effect on the zinc industry.

On the other hand, zinc die castings are standing up very well to aluminum competition in automobile applications. We believe this advantage for zinc is going to increase rather than decrease. A number of factors in the automobile industry indicate that zinc will replace aluminum in many major areas in the 1960 models as compared with the 1959 models.

The improvements which have come in chromium plating zinc die castings already have had favorable acceptance by the automobile industry.

Another factor in favor of the zinc industry is the increased trend by the automobile industry to use galvanized steel in many parts of the automobile body which are subject to corrosion.

On the whole, we regard the future position of zinc in industry with confidence — but not with complacency.

KAISER ALUMINUM & CHEMICAL CORP.

In 1955, after an extensive market research study, Kaiser Aluminum arrived at an estimate that the nation's total aluminum consumption would be over four-million tons annually in 1965. In preparation for this anticipated market, Kaiser has been engaged in an expansion program totaling more than $400 million, to build facilities in preparation for this future growth. At the completion of our present expansion program, we will have production facilities of 609,500 tons, and we have plenty of room for expansion.

In spite of inevitable short-term changes in industrial activity that occur from year to year, we believe that consumption by 1965 will meet our estimate.

ALUMINIUM LIMITED SALES, INC.

The first step we have taken toward meeting the future needs of the automotive industry for aluminum is the formation of Chryslum, Ltd. This is a jointly-owned company formed by Chrysler Corp. of Canada as a major owner, and by Aluminum Co. of Canada.

The new company will furnish a major portion of aluminum ingots needed by Chrysler of Canada and a portion of ingots required by the Chrysler Corp. Ingot for both Canadian and U.S. production will be furnished by Alcan's Beauharnois, Quebec, plant. The new company will build a die casting plant close to the present engine plant, Chrysler Center, Windsor. Chrysler Corp. of Canada uses about 100 lbs of aluminum per car (on a standard four-door sedan) as compared with an industry average of about 50 lbs.

REPORT FROM DETROIT ON ZINC

By JAMES E. ZANE*

NEXT YEAR'S AUTOMOBILE will show a marked increase in zinc consumed for die castings, according to reports from the auto industry and independent die casters. In 1960, general automotive use of zinc per car for die castings should go up as much as 15%, says American Zinc Institute, Inc.

Across-the-board gains for zinc reflect not only the automotive industry's continued reliance on the special advantages of the metal, but new confidence in the improved corrosion performance of zinc die castings electroplated by several updated approaches already in widespread and growing use. Significantly, a number of automotive components which were made of other metals in 1958 and 1959 will be converting back to zinc in 1960 models.

continued on next page

*MARKET DEVELOPMENT ENGINEER AMERICAN ZINC INSTITUTE, INC.

INCREASES AT CHRYSLER

Automotive industry acknowledgement of zinc merits is illustrated at Chrysler. The entire 1960 line will carry die cast zinc headlight and taillight doors, as well as grillework – in many instances, a return from stainless steel and aluminum stampings used in 1959.

Specifically, the 1960 zinc die castings picture at Chrysler shapes up like this:

Plymouth will show substantial across-the-board zinc increases, including door handles returning to die cast zinc from stamped and formed stainless steel. Dodge will continue to rely heavily on zinc die castings, maintaining the high consumption level established in 1959. De Soto will show a small increase, as will the various Chrysler models.

FORD USING MORE ZINC

At Ford, zinc die castings will either hold their own or show nominal increases. The Ford car itself will carry slightly heavier die cast zinc grille parts in 1960. Edsel, Mercury, and Lincoln will continue essentially as in 1959, with slight increases indicated. Because of corrosion problems encountered with other metals, substantial return to zinc die castings appears assured for 1961.

ALSO AMERICAN MOTORS, GM

At American Motors, 1960 styling changes will incorporate a "major change in appearance," with a nominal increase in use of zinc die castings.

General Motors shows no signs of any significant changes following the dramatic restyling introduced in 1959, and zinc die castings will make only small advances here. However, GM is showing strong interest in improved electroplating of zinc die castings, and there is much evidence that a major facelift forecast for 1961 GM models will rely heavily on electroplated zinc die castings.

DIE CAST GRILLES

Because zinc die castings can be produced in intricate shapes readily, economically, and to close dimensional tolerances, many grille designs rely substantially on this metal, and large tonnages should be consumed for these applications in 1960. For example, grilles on the Edsel, Oldsmobile, Buick, Mercury, Lincoln, Chrysler, and Rambler will be zinc die castings. In addition, substantial zinc tonnage will go into grilles and/or grille parts on 1960 Dodge, De Soto, Chrysler, Imperial, Plymouth, and Studebaker models.

PLATING IS IMPORTANT

Recent plating developments which offer important improvements in corrosion performance are being rapidly adopted by auto manufacturers as standard requirements throughout their lines.

Documenting the auto industry's acceptance of the new systems, recent corrosion tests at Battelle Memorial Institute show that zinc die castings copper-nickel-chromium plated by any one of several new electroplating approaches have dramatically increased corrosion-resistant service life.

Briefly, two significant plating approaches have emerged. One utilizes a modified bright and crack-free chromium coat as thin as .000025 inch deposited over conventional layers of copper and nickel. Accelerated corrosion tests at Battelle showed that this system provides from two to three times the corrosion protection of conventional plating systems.

The other advance lies in a duplex nickel system that uses two layers of nickel electrodeposited in different baths under controlled conditions. Used in conjunction with a conventional copper undercoat and chrome finishing layer, this approach furnishes much more corrosion protection than an equal thickness of a single bright nickel layer.

Responding to the new findings, which supplemented and confirmed results of independent investigations among plater, plating supply houses and the automotive industry itself, Ford, General Motors, and Chrysler are requiring vendors to use updated electroplating systems, thereby reinforcing the industry's traditional reliance on electroplated zinc die castings for a wide variety of decorative and functional-decorative applications.

General Motors uses dual chrome, bright crack-free chrome, and duplex nickel methods for zinc die castings; Chrysler is requiring duplex nickel for most exterior brightwork.

The continued expansion of these processes for improved plating is expected to result in universal use throughout the entire automotive industry within a relatively short time.

FUTURE LOOKS GOOD

Despite the general automotive 1959 styling trend

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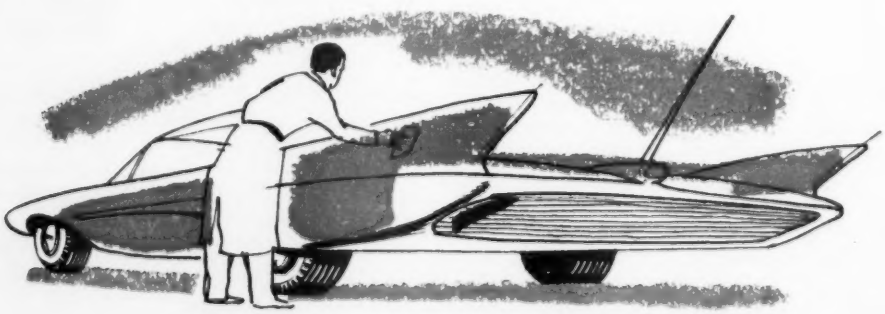

Associations Share Optimistic Outlook

CUSTOM DIE CASTERS SEE HIGH OUTPUT

By DAVID LAINE*

DIE CASTING SHIPMENTS in the first six months of 1959 showed a marked improvement over the comparable period of 1958. While current die casting output still falls short of record production, there is every reason to believe that the full 1959 year will see a return to the steadily-increasing use of die castings interrupted temporarily by the 1957-1958 business recession.

In this year of major labor contract negotiations in the metal industry, it is difficult to prepare firm estimates of die casting production. Estimating of this kind must also reflect passenger car output, since this represents the largest single consuming field for die castings. Taking these variables into consideration, the American Die Casting Institute has, at the request of PRECISION METAL MOLDING, made studied predictions of die casting production totals for the full 1959 year, which are presented here.

Assuming that the anticipated 1959 passenger car output of 6.5 million units is realized, and that labor settlements are without extended strikes, ADCI estimates that 310,000 tons of zinc die castings and 195,000 tons of aluminum die castings will be produced in 1959. These figures, which represent both custom and captive shop output, compare with 252,000 tons of zinc die castings and 145,125 tons of aluminum die castings in 1958.

Even taking the dimmest view of car production and labor strife, ADCI sees decided improvement over 1958 with a minimum production of 275,000 tons of zinc and 185,000 tons of aluminum die castings being turned out in 1959.

Furthermore, all indications among the 125 ADCI custom die casting members point to steadily higher levels of die casting output in 1960 in both of these major die casting metals.

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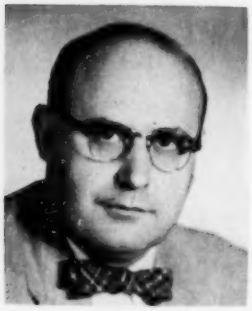
*SECRETARY AMERICAN DIE CASTING INSTITUTE



INDUSTRY LOOKS AGAIN TO MAGNESIUM

By JERRY SINGLETON*

RETURNS for the first half of 1959 indicate that magnesium die casting shipments are running at nearly twice the 1958 rate. If this holds throughout the year – and there is every reason to believe that it will – shipments may exceed those of any non-war year. Where total shipments were 1600 tons in 1958, volume in the first half of 1959 reached nearly 75 percent of that figure.

Last year was a poor one for magnesium die castings, just as it was a poor one for business generally. Unfortunately though, tonnage shipments of magnesium castings dropped more than other categories of magnesium cast products. As reported by ADCI, shipments were distributed approximately as follows:

Automotive	17.3%
Other Transportation	3.1
Machinery and tools	44.7
Electronics & Communications	.1
Office Machines	11.1
Photographic, Optical & Recording	9.4
Home Appliances	1.1
Toys and Sporting Goods	5.0
National Defense	12.7

Currently, there is a great deal of enthusiasm for the future. There is every reason to believe that sales will continue to climb, and there is a widely-held belief that the volume in the automotive industry will lead the parade. There can be no doubt that the work, essentially of a development nature, accomplished in the past few years will produce important results in the next few . . . and in all probability at an accelerated rate. Alloy development and improved techniques may currently be outrunning application, but even as the chicken-and-the-egg question is perennial, so is the interrelationship of techniques, alloys and use.

There is probably no other field of material application where price plays so important a part as in die casting. Nevertheless, there are many places where the inherent characteristics of magnesium dictate its use. It is toward these applications that major effort is being directed. Results are such as to generate new enthusiasm and, with it, redoubled effort to add neglected applications that need magnesium.

A new motion picture camera-projector recently introduced features a case made almost entirely of magnesium. Speaking of the factors which influenced the selection of this metal, an officer of the manufacturing company said, "We can point to any number of features in the unit which are unique in this price range. But whatever the features, this product would have been impossible without using magnesium."

*EXECUTIVE SECRETARY
THE MAGNESIUM ASSOCIATION

ZINC HINGES FUTURE ON QUALITY

By J. L. KIMBERLEY*

IN THESE DAYS of rapid advancement in technical fields, and with the increasing competition in light metals and plastics, it might be well to review recent events and reappraise zinc's position.

It remains true that the automotive industry is the greatest consumer of zinc die castings. In the area of prediction, the present steel strike and the fact that (as of this writing) only partial information is available on specific uses in the 1960 models, any attempt to predict the total tonnage of zinc to be die

*EXECUTIVE VICE PRESIDENT
AMERICAN ZINC INSTITUTE, INC.

cast in the near future would be foolhardy. At the same time, the events of the past eighteen months, including developments in the field of plating, supported by such specific information as has been made available, leads to a feeling of optimism for the 1960 model year, and a prediction of "more per unit."

Let's review some of these events. The zinc industry began the year 1958 with problems created by the continuation of the general business recession which had started in the spring of 1957. Supply of all grades of zinc continued in excess of demand. A business recovery, started in the late spring of 1958, has carried forward from that time until the present. Consumption is at a good rate, producers' stocks are down, but there is no real threat of significant shortage.

Among the zinc industry's specific constructive actions, the plans for an Expanded Research Program within the structure of the American Zinc Institute became fully implemented in September, 1958, with the appointment of a research director and a supplementary staff. This international program already has the financial and technical support of twenty producers, six with interests outside of the United States.

For all practical purposes, the domestic support of this research program covers the entire American industry. Within the research program, projects underway which concern zinc die casting include a comprehensive study of plating at Battelle and a basic investigation for the zinc industry at The New Jersey Zinc Company aimed at the development of improved die casting alloys. This latter project has the objectives of developing alloys with improved strength, as well as higher resistance to creep and temperature, while retaining the basic advantages inherent in zinc die casting. Studies are planned on other processes for finishing, including anodizing.

Since August, 1958, the AZI has conducted a perpetual market survey in the automotive industry. It is intended to expand this activity into other markets for zinc die castings. For the present, the AZI is convinced that the automotive usage of zinc die castings is very solidly entrenched.

SMELTERS PREDICT EXPANDING USAGE

By CARL BURTON*

THE ALUMINUM SMELTING industry expects to increase its markets in the automobile industry despite the "hot metal" deals entered into by some of the car manufacturers.

Aluminum used in automobile manufacturing has increased from an average of about 25 pounds a car in 1954 to more than 50 pounds in 1959 models. Within the next few years, it's expected to increase to an average of more than 150 pounds per car, with manufacturers switching to aluminum die castings for engine blocks, cylinder heads, wheels, brake parts, and other components.

ASRI officials estimate that about 40 percent of the smelting industry's more than 400,000 tons of production this year will go to the automobile industry. They expect this percentage to increase with the growing use of aluminum in automobiles. They point out that the industry's current alloying capacity of some 450,000 tons could easily be boosted to more than 600,000 tons without any major expansion in plant facilities.

Historically, the smelters—through their foundry and die casting customers—have supplied the automobile industry with more than 60 percent of its aluminum alloy castings. This ratio, however, will change drastically in the next few years because of the "hot metal" contracts between major automobile manufacturers and primary aluminum producers.

Recognizing that their own industry could not supply all of the castings for the anticipated rapid increase in aluminum use by the automobile industry, the smelters are not disturbed at the prospect of the primary aluminum producers taking on a bigger proportion of the automobile market.

The smelters feel that the availability of virgin aluminum will encourage the car manufacturers to increase their use of the metal at a much faster rate than would have been the case if they had to rely entirely on the smelting industry. This, in turn, the smelters say, will mean a continuing and growing market in the automobile industry for both virgin and smelters aluminum. An immediate increase in the use of aluminum in automobiles also will mean, in later years, a substantial growth in the supply of scrap aluminum – the smelting industry's raw material.

They point out that among the many applications of castings from smelters alloys currently used are pistons, carburetor parts, manifolds, generator components, power drive and fuel pump parts, and hard-

*SECRETARY
ALUMINUM SMELTERS RESEARCH INSTITUTE

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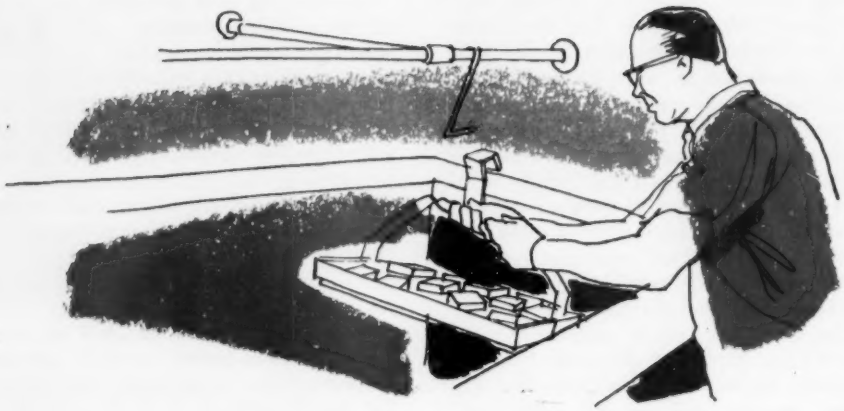

New finishing techniques . . .

Assure Bright Future for Die Castings

IN RETROSPECT, 1958 and 1959 were probably the two outstanding years for advances in the surface finishing of die castings.

A long-delayed public resentment against poor quality chromium plating on both zinc die castings and steel components – particularly on automobiles – forced the die casting industry, the metal finishing industry, and the automobile companies to clean up their collective house. The result of this buyers' revolt has been little short of phenomenal. At least three new plating systems and two new accelerated corrosion tests were announced. As a result, the future uses of zinc die castings may be materially expanded.

Also announced was at least one new aluminum die casting alloy which has the reported advantage of being anodizable. Through the use of vacuum die casting, anodizable alloys too sluggish to die cast normally are used in emblems for two current production cars. Let's look at some of these developments.

CHROMIUM PLATING OF ZINC DIE CASTINGS

Stress-Free Chromium. One system for superior corrosion protection of zinc die cast parts is the stress-free chromium plating system developed by the Udylite Research Corp. Chromium plate, as normally deposited, is hard and brittle; it also is pitted and cracked. Since the pits are relatively far apart, the electrolytic cell set up has a high voltage which accelerates the rate of corrosion. In this system, chromium is deposited at a higher-than-normal temperature, with a higher current density, and from two to four times as thick a layer is deposited. The resulting chromium layer offers corrosion resistance many times that secured from the older systems. This method appears in PRECISION METAL MOLDING, July, 1958, page 39.

Dual Nickel. Another protective and decorative system developed to give zinc die castings better corrosion protection is dual nickel. In this system, the nickel is applied in two layers. First a semi-bright, sulfur-free nickel is applied over the copper, followed by bright nickel. Finally, the standard chromium plate is deposited. Work on this system was done by the American Zinc Institute, The Die Casting Research Foundation, and the Doehler-Jarvis Div. of National Lead Co. This plating system improves the corrosion resistance 25% to 33%, as determined by the ASTM rating system for chromium plating. This finishing system was reported in PRECISION METAL MOLDING, July, 1959, page 47.

Duplex Chromium. Another chromium plating method was developed by Metal & Thermit Corp. This method utilizes standard copper and nickel plates, followed by two separate chromium plates. Full details of this plating method are reviewed in this issue, page 71.

All three of these plating methods, and variations of them, increase the cost of processing zinc die castings. These cost increases are roughly the same, regardless of the system used. However, they are relatively minor, especially if, for example, the only good alternative would be the use of stainless steel. Such a change would entail a vast amount of redesign, retooling, and much greater expense. The amount of direct labor involved would be greatly increased, with consequent increase in cost.

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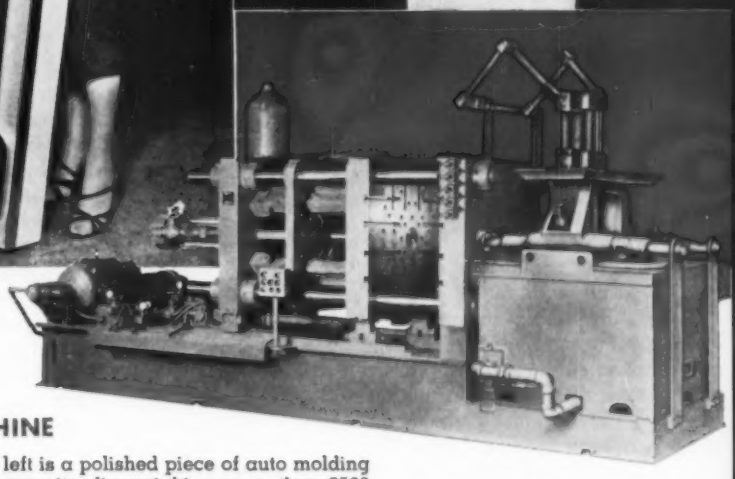
HOLLAND DIE CASTING COMPANY, with skill and experience, produces extraordinary castings on B&T DIE CASTING MACHINES!



Joe: Better get the dope on these B&T machines Al.

CAST ON A 750-TON B&T MACHINE

1 The single finished part in the photo at the left is a polished piece of auto molding trim 64 inches long. It is produced in a two-cavity die weighing more than 8500 lbs. and measuring 84 inches in length. Weight of shot is 10½ lbs. Platens on the B&T machine are 48 inches wide and thus the 84 inch long die actually extends 1½ feet beyond each side of the machine. In successfully holding and casting this long piece the B&T 4-toggle lock-up system forcefully demonstrates its remarkable efficiency.

CAST ON A 750-TON B&T MACHINE

2 This intricate casting is the console of an automatic washing machine. The shot required weighs 14 lbs. Six 5 inch mounting studs in the back of the part are cast independently of the wall. The console has intricate coring and the instrument cluster is chrome plated and painted . . . a difficult casting to produce.

CAST ON A 600-TON B&T DIE CASTING MACHINE

3 This triangular-shaped casting is a chrome plated gravel guard for one of America's finest cars. It is made by the Holland Die Casting Company in a single cavity die weighing more than 6,000 lbs. Weight of the shot is 6½ lbs. Finish obtained is excellent. An outstanding production job for a 600-ton machine and indicative of the remarkable results obtainable with all B&T machines. Holland Die Casting Company's facilities include 12 B&T die casting machines in capacities up to 1,000 tons.

DIE RESEARCH: You are invited to use our Die Casting Research Center for experimentation and furtherance of die casting techniques.

B&T HYDRAULIC DIE CASTINGS TRIM PRESSES are exceedingly fast and efficient. Write for details.

Investigate B&T Die Casting Machines before buying any other. The line includes High-Pressure Cold-Chamber and Hot-Chamber types in capacities of 125, 150, 200,300, 400, 500, 600, 700, 800, and 1,000 tons. Write or phone for complete details.

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EDITOR'S NOTE: In recent months there has been a great deal of discussion among both users and producers of die castings about an article which appeared in a Russian journal on the vacuum die casting of steel.

So that all of our readers could become conversant with this material, PRECISION METAL MOLDING *commissioned its English correspondent to secure a good translation of the article.*

While the article, by its title, claims to discuss the die casting of steel, it is actually a discussion of another vacuum die casting system which the author claims permits the casting of steel. There is no discussion of die life, die steels, casting accuracy, surface finish on the casting, lubricants, shot sleeve and plunger tip material or life. In fact, none of the problems which die casters in this country know to be deterrents to the die casting of steel are discussed, and few of them more than casually mentioned.

How to die cast steel is still just as much of a problem as before, in spite of this Russian "advance." Apparently this is another case of anticipation being far better than realization.

The Die Casting of Steel Under Vacuum

By V. M. BELOV and S. A. KAZENNOV*

IN ADDITION to its manifest merits, the die casting process has certain disadvantages which limit its applications. In particular, die cast components tend to suffer from porosity. For this reason, the process cannot be effectively employed with alloys which develop their optimum properties only after heat treatment; die castings raised to a temperature approaching the point of plastic deformation undergo dimensional changes and their surfaces become blistered.

From among the very large range of non-ferrous alloys, therefore, it is possible to select only a few that are utilizable in the die casting process, while the die casting of ferrous alloys has not been a practical proposition. Indeed, only major improvements in technique, and the elimination of porosity, make possible the die casting of steel components. Experience has shown that, even under optimum conditions, it is not possible to produce steel die castings entirely free from porosity with conventional techniques, and the only solution to the problem is to adopt the vacuum method of die casting.

Early experiments in vacuum die casting on machines of both horizontal and vertical metal-well types, entailed the complete containment of the die within a small evacuable chamber formed between the die platens. This in turn was connected to a larger vacuum chamber exhausted by a pump.

The air in the cavity is sucked out along venting channels machined in the joint face of the die and by way of the ejector housings. After the closure of the die and the simultaneous sealing of the chamber in which it is contained, metal is ladled into the shot-sleeve (metal-well). Then, at the same moment, the valve evacuating the die chamber and that controlling the injection plunger are actuated. On machines with a horizontal shot-sleeve, evacuation is effected while the plunger-tip moves from one end of the sleeve to the other.

Experiments along these lines have not produced satisfactory results, primarily because the venting channels must be shallow (0.05 mm. for aluminum alloys and 0.1 mm. for steel) and the air is thus not evacuated sufficiently quickly from the cavity. The permissible time during which the molten metal may remain in the metal-well of a vertical-injection machine, or the equivalent time during which, in a horizontal-injection machine, the plunger moves from one end of the sleeve to the other, is necessarily too short for evacuation of the cavity to be effectively completed by the means described. If time is allowed for complete evacuation, which takes 10 to 15 seconds, not only does the metal chill in the shot-sleeve, but it may even solidify completely.

In the novel method of vacuum die casting now to be described, no use is made of venting channels in the joint-face to withdraw air from the cavity; instead, air is sucked out through the gate and runner system and, thence, by way of the free space above the charge of metal lying in the shot-sleeve. The method is shown in Figure 1.

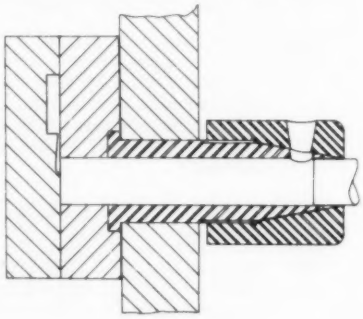
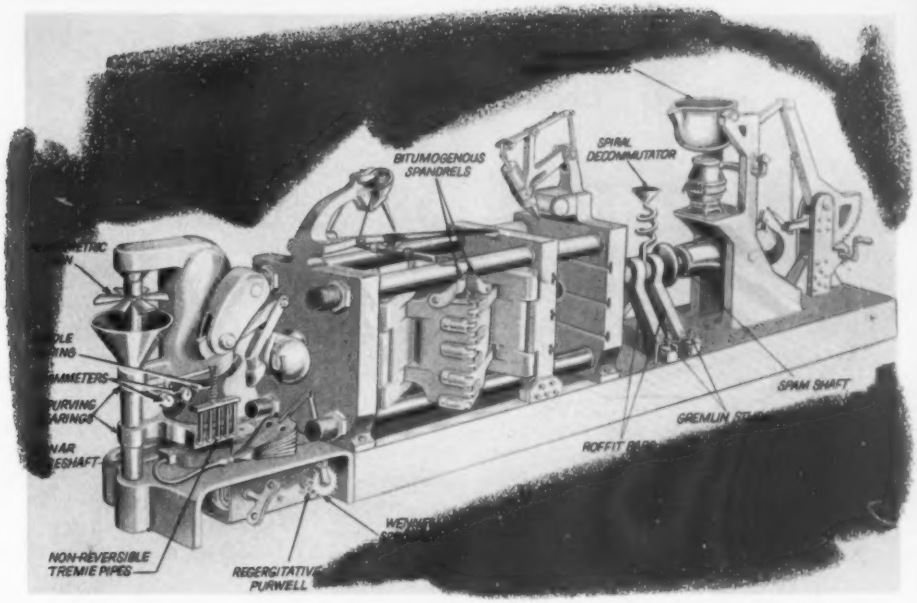


FIGURE 1.

No external hood or chamber shrouding the die is called for, since in the case of dies for casting steel components the gate area is so large that, despite a slight leakage back between the die members into the cavity, a satisfactorily reduced pressure is maintained while injection takes place. Referring to Figure 1, the principal ele-

continued on page 76

*Translated from "LITEINOIE PROISVODSKVO" By H. K. BARTON and R. GRUNBERG



Introducing . . .

The Turbo-Encabulator Die Caster

By DR. GAZZUN DA HEIT*

FOR A NUMBER of years now, work has been proceeding in order to bring perfection to the crudely-conceived idea of a machine that would not only supply inverse reactive molten metal for use in unilateral die cast detractors, but would also be capable of automatically synchronizing cardinal grammeters. Such a machine is the all-new Cleveland Automatic "Turbo-Encabulator Die Caster Extraordinairre."

Basically, the only new principle involved is that instead of chamber heat being generated by the relative motion of conductors and fluxes, it is produced by the modial interaction of magnetereluctance and capacitive directance.

The original machine had a base-plate of pre-fabulated aluminite, surmounted by a malleable logrithimic casing in such a way that the two spurving bearings were in a direct line with a pentametric fan. The latter consisted simply of six hydrocoptic marselvanes, so fitted to the ambifacient lunar waneshaft that side fumbling was effectively prevented. The main toggle was of the normal lotus-0-delta type placed in panendermic semi-boloid slots in the stator, every seventh oil line being connected by a non-reversible tremie pipe to the differential girdlespring on the "up" end of the grammeters.

Forty-one manestically spaced grouting brushes were arranged to feed into the chamber slip-stream a mixture of high S value phenylhydroliodohexamine. Both of these liquids have specific pericostites given by P-2 .5Cn6.7, where in P is the diathetical evolute of retrograde temperature phase disposition and C is Cholmondeley's annular grillage coefficient. Initially, n was measured with the aid of a metapolar refractive pilfrometer (for a description of this ingenious instrument see L. E. Rumpelverstein in "Zeitschrift fur Elektrotechnistatische-Donnerblitze" vol. vii), but up to the present date nothing has been found to equal the transcendental hopper dadoscope. (See "Proceedings of the Peruvian Nitrate Association" June 1941.)

Die cast engineers will appreciate the difficulty of nubing together a regergitative purwell and a supramitive wennel-sprocket. Indeed, this proved to be a stumbling block to further development until, in 1942, it was found that the use of anhydrous nangling pins enabled a krptomastic bolling shim to be tankered.

Our early attempts to construct a sufficiently robust spiral decommutator failed largely because of a lack of appreciation of the large quasi-piestic stresses in the gremlin studs; the latter were specially designed to hold the roffit bars to the spamshaft. When, however, it was discovered that wending could be prevented by a simple addition to the living sockets, almost perfect castings were secured.

The operating point is maintained as near as possible to the H. F. ram peak by constantly fromaging the bitumogenous spandrels. This is a distinct advance on the standard nivelsheave in that no dramcock oil is needed after the phase detractors remiss.

Undoubtedly, the turbo-encabulator has now reached a very high level of technical development. It has been successfully used for operating nofer trunnions. In addition, whenever a barsecent skor motion is required, it may be employed in conjunction with a drawn reciprocating dingle arm to reduce sinusoidal depleneration.

**Dr. Gazzun Da Heit really works for Cleveland Automatic Machine Co., although he uses an assumed name there. He frequently appears at sales meetings, which are never the same after he gives his talk. We thought our readers would enjoy it, especially since there seems to be a definite trend toward up-retracterization in the thermocastery of exotic monometamerodic consumption these days.*

At Intertype Corporation . . .

Extrusions Save Costly Machining

TAKE A LOOK at your products. There are probably some parts which are used in multiples. If there are, have you considered the possibility of using extrusions?

You can do tricks with extrusions to lower manufacturing costs and get a better part. For example, let's look into an Intertype line-casting machine or an Intertype Fotosetter photographic typesetting machine and see how clever designing around some extruded sections cut machining costs, insured interchangeability of parts, while still providing all of the functioning characteristics which are required.

The keyboard cam shown in Figure 1a is a good example of these extruded parts.

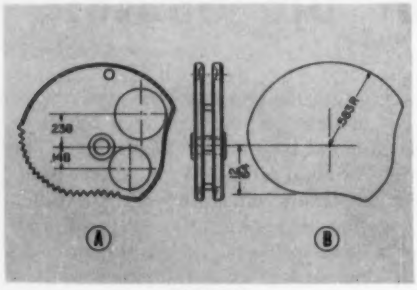


FIGURE 1.

It's not hard to figure out the machining operations necessary to make this part from bar stock. There would be profile milling, tooth cutting, lathe operations, screw machine operations, and drilling and reaming. Of these, the profile milling to get the right contour and the individual tooth cutting operations would be by far the most expensive and the most difficult. Now an Intertype or Fotosetter machine uses from 90 to 124 of these cams per machine. So, just imagine the number of milling machines and gear cutters that would be required if they were made one by one.

Now take a look at Figure 1b. There's the complex cam contour as an extruded section, exactly the same shape from end to end of a long brass extrusion. So, as a starter, the raw material is purchased to size and shape, saving a nasty job.

After the stock has been received, it is cut into 6-foot lengths. A length is mounted in a planer and the 20 teeth cut. This way, the teeth on about 200 cams are cut in little more time, and probably for as low or lower cost, than would be required to cut the teeth on a single cam by other methods. Why not extrude the bar with the teeth on? A maximum radius on the teeth of 0.005 cannot be held, so that a clean-up operation would have to be done later to get the required sharpness.

The escapement bar on these machines is another place where the use of a brass extrusion saves a lot of money. Like the keyboard cam, the basic shape is complex and it is here that extruded material saves money. Figure 2a shows the shape of the section that's required. Since each bar is almost 17" long it can be made in either of two ways. It can be machined from bar stock or produced from an extruded section that's almost to finished shape. The most economical method is to use extruded stock—in this case, brass. It's made by Chase Copper & Brass Co., the same firm that makes the keyboard cam stock. It's shown in Figure 2b.

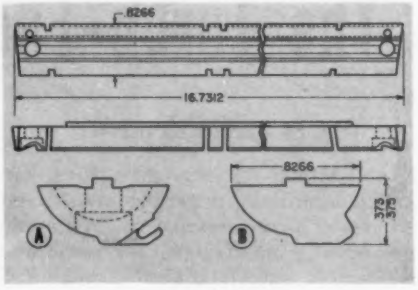


FIGURE 2.

Now let's look at one more extrusion which the Intertype designers have used (Figure 3). This time it's an aluminum extrusion made by Alcoa. This escapement spring bar (Figure 3a) would drive a machinist crazy if he had to make it out of bar stock. It used to be a brass part, but was changed to aluminum to get lighter weight and to lower the cost. This is another part that's almost 17" long and, even starting with an extrusion (Figure 3b), a lot of machining still has to be done on it.

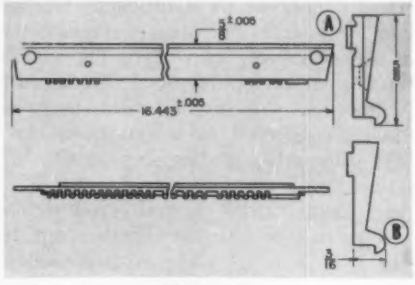
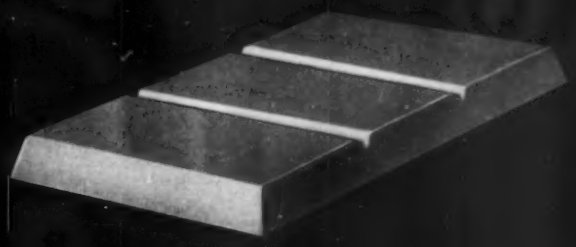


FIGURE 3.

In the case of both the escapement bar and the escapement spring bar, only four of each are used per machine. However, extrusions lower production costs because they save difficult initial machining operations.



why

AMAX ZINC-BASE ALLOYS

mean

BETTER DIE CASTING

AMAX Zinc-Base Alloys mean better die casting for a number of reasons, but basically, their sum is this one critical fact: *Quality control through every phase of the production cycle.*

From raw materials to final ingot casting, AMAX's rigid standards ensure soundness and uniformity within precise composition specifications. Step-by-step control yields zinc-base alloys which help assure you of uninterrupted, trouble-free casting and flawless products. Exacting standards that are routine practice at AMAX include:

- **Only premium-grade raw materials go into AMAX Zinc-Base Alloys**
- **Sampling and testing is performed at every production step**
- **Each heat is spectroscopically analysed, assuring precise composition**
- **Every individual production order is carefully supervised**

If you would like further facts on the advantages of specifying AMAX, or if you would like technical assistance, please contact the Metal Sales Department.

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61 Broadway, New York 6, N. Y.

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For more information circle No. 6 on the Reader Service Card

The trophy industry uses . . .

Three Processes for Style and Appearance

A LITTLE KNOWN, but economically important application of permanent mold castings, die castings, and extrusions is in the trophy industry. Certainly not a large industry, but for its value in creating good public relations, an extremely important segment of modern human relations.

Most trophies are one-of-a-kind or, at best, just a few of each kind. Mass production is not possible, but certain of the components can be produced in fairly large quantities since they are widely used, though assembled differently.

An example is the trophy shown. This, a very large bowling prize, has four metal elements which are used in many different assemblies. The figure of the man, the cup, the eagles, and the columns.

BOWLING TROPHY is made by three PMM processes.

The columns are, of course, the simplest to produce. They are extruded brass tubes that need only to be cut to length.

The other decorative segments of this trophy are all permanent mold cast in a lead-antimony alloy which is specially made for this type of casting by Belmont Smelting and Refining Co.

The artist who designs the individual parts first makes a model in plaster. Then, depending on whether one or several identical parts are to be made, the process differs. When a single casting is to be made, a plaster mold is made from the model and the final casting made in the plaster mold.

If, however, a number of castings are going to be made, the mold is then made in bronze. This mold then serves as a permanent mold for casting the antimony-lead alloy. Metal is all gravity poured from hand ladles.

SURFACE FINISH IMPORTANT

Because of the complex surface detail that is almost always involved, surface finish is important. Little can be done with plaster molds, but the bronze molds are carefully polished and the parting planes kept flat so that there is as little flash as possible. Gating is always on a surface which will not show when the trophy is completed, generally the base.

Almost all trophies have a simulated gold finish. The parts are first hand buffed and polished. This is followed by a bright copper flash, a light nickel plate (generally bright nickel), and finally a bright brass which looks like polished gold. The final brass surface is, of course, fragile and subject to corrosion unless protected. A coat of lacquer is always applied to give protection against atmospheric corrosion and the corrosive action of moisture left by handling.

Depending on how the individual parts are to be mounted, the base will be either cored for a threaded fastener or a machine screw will be cast-in.

Earlier, mention was made of the use of die castings in the manufacture of trophies. These are generally limited to items used in large volume. For example, the small loving cups that are so widely used are die cast in zinc. Trophy makers stock these parts in the cast and trimmed condition to use as occasion demands. When engraving on any of the castings is required, it is done before plating so that the base metal will not show through.

In some cases, manufacturers are turning to chromium plating for the final finish. Where this can be used there is a decided economy. The finishing cost is about the same through the plating, and the final lacquer coating can be omitted. The saving is, of course, in the final lacquering.

Tool Steels and Heat-Treatments For Aluminum and Magnesium Extrusions

Extrusions in aluminum and magnesium are widely used in the building, industrial and transportation fields. In most respects the extruding of aluminum and magnesium is similar, with the exception of the pressures needed. In many cases the same dies can be used for either material. The same tool steels, therefore, can be recommended for both materials.

AISI designations are given for all steels where these are known. A few steels are given by the name assigned by Crucible Steel Co. of America. The nominal compositions of these materials is given below.

AISI Type	Preheat	High Heat	Quench	Temper	Brinell	Rockwell-C
DIES FOR SHAPES, TUBES, AND RODS						
H-11	1400 F	1800 F	Air	1100 F	400/421	43/45
H-12	1400 F	1850 F	Air	1050 F	421/443	45/47
Rexalloy A*	No heat treatment necessary — Furnished about Rockwell C-40/44					
Rexalloy 33**	No heat treatment necessary — Furnished about Rockwell C-54/58					
H-26	1500 F	2200 F	Oil and Air	1100 F	615/654	58/60
M-2	1500 F	2100 F	Oil and Air	1100 F	615/654	58/60
DUMMY BLOCKS, BACKER BLOCKS (BOLSTERS), AND DIE HOLDERS						
L-2	1200 F	1650 F	Oil	700 F	443/469	47/49
H-11	1400 F	1800 F	Air	1100 F	400/421	43/45
H-12	1400 F	1850 F	Air	1050 F	421/443	45/47
MANDRELS OR SPIDERS						
H-11	1400 F	1800 F	Air	1000 F	525/560	53/55
			Temper threaded shank at	1300 F	279/311	29/33
H-12	1400 F	1850 F	Air	1000 F	512/543	52/54
			Temper threaded shank at	1300 F	279/311	29/33
H-21	1500 F	2150 F	Oil and Air	1100 F	469/525	51/53
			Temper threaded shank at	1350 F	279/311	29/33
MANDREL INSERTS						
H-26	1500 F	2200 F	Oil and Air	1100 F	615/654	58/60
M-2	1500 F	2100 F	Oil and Air	1100 F	615/654	58/60
LINERS						
H-11	1400 F	1800 F	Air	1100 F	400/421	43/45
H-12	1400 F	1850 F	Air	1050 F	421/443	45/47
RAMS						
H-11	1400 F	1800 F	Air	1100 F	400/421	43/45
H-12	1400 F	1850 F	Air	1100 F	371/390	40/42

Grade	Typical Composition			
	C	W	Cr	Co
*Rexalloy A	1.20	4.5	28.0	65.0
**Rexalloy 33	2.25	17.0	33.0	44.0

Data courtesy, Crucible Steel Co. of America

Investment Casting Simplifies Production

. . . of difficult-to-machine shapes

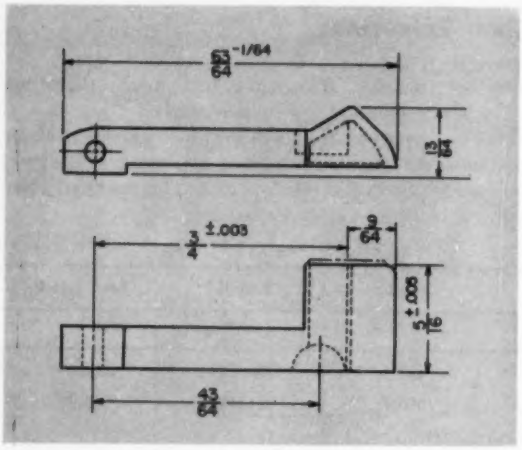


FIGURE 1.

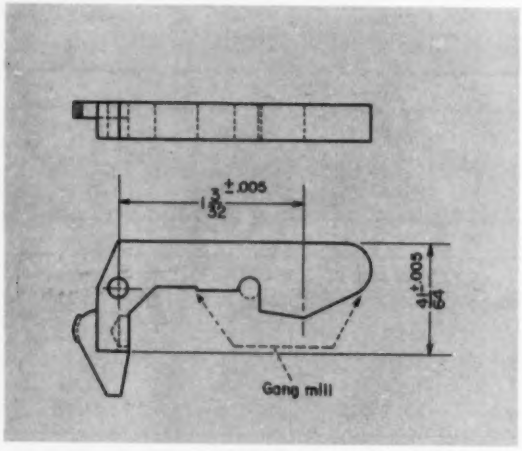


FIGURE 2.

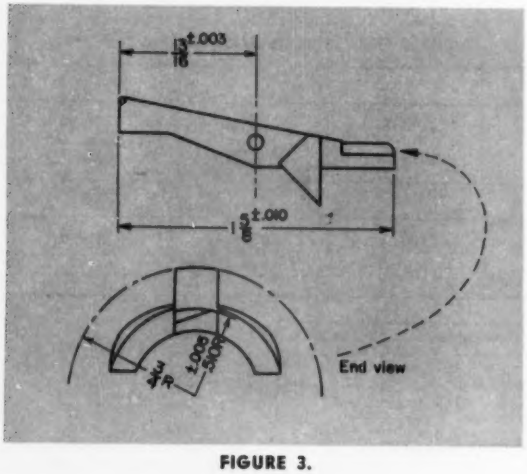


FIGURE 3.

BECAUSE THE FUNCTIONS it performs are unusual, it isn't surprising to find a lot of queer-shaped parts on an Intertype Fotosetter photographic typesetting machine.

All these parts could be machined out of wrought stock. Most of them could be made as sand castings and then finish machined. But to make them in that way would be economic suicide. So, for those parts with unusual shapes of which only one is needed for each machine, the designers turned to investment castings.

Why? Because an investment casting gives them the shape they want, in the metal they need, and in the most nearly-finished form. Tooling costs are relatively low, special form cutters are not needed, and for the most part, the machine work that has to be done on the casting requires only standard machine tools and simple holding fixtures. All of this means a saving. Then, through the use of investment castings, faster delivery can be secured and it doesn't make much difference whether one or one thousand parts are ordered at a time – the price is pretty much the same.

Figure 1 shows an assembling elevator gate pawl. This part is used in pairs, left and right hand, one pair per machine. It is an original investment casting design and is cast in an oil hardening, manganese-chromium-tungsten steel (Crucible Steel Co.'s Ketos or its equivalent). The part is cast to dimensions except for the surface where the casting gate is located. This surface must be machined, one hole drilled, and the part hardened to 45-55 R_c.

The delivery side latch shown in Figure 2 is another current part that was designed originally as an investment casting. It is cast in a 0.9% to 1.0% carbon tool steel and hardened to 51-57 R_c. This part has dimensional and finish requirements which cannot be met by the investment casting foundry. The finishing operations are, therefore, more extensive than on the gate pawl. The shape of this piece is, however, so complex that machining from wrought stock would be excessively expensive and wasteful. Hence, the original investment casting design.

The last part illustrated (Figure 3) represents a change from a part originally machined from wrought stock to an investment casting. This clutch pawl is complete as received from the foundry, except to drill one hole and harden. It is made of the same oil hardening tool steel (Ketos) as the part shown in Figure 1. After drilling, it is hardened to 56-58 R_c. While this part is a conversion, no figures are now available to indicate the saving made by the change to an investment casting. The change was made, however, to reduce costs.

All three of the investment castings are finished with a black oxide surface finish.

PRODUCT STANDARDS FOR DIE CASTINGS

ADCI-E14-59T (Part 1)
DIE CAST THREADS
(External Threads)

NOTE: The data shown herein represent normal production practice at the most economic level. Variations from recommended thread designs or tolerances should be specified only where and when necessary since additional cost may be involved.

DIE CAST THREADS — (Page One)

Under certain conditions, die cast threads can be obtained in zinc, aluminum and magnesium die castings. Generally, this practice is confined to external threads where precision fits are not required. Unless parts are very simple it is usually less costly to machine threads.

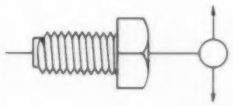
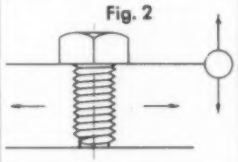
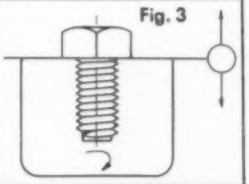
External Threads

External threads can be formed across the parting line of dies (Fig. 1), with slides (Fig. 2), or with solid die components (Fig. 3). Such threads are of the American National Thread Form.

Tolerances

The tolerances applicable to external die cast threads reflect the method by which the threads are formed as shown in the table.

TOLERANCES FOR EXTERNAL DIE CAST THREADS
(Based on single cavity die)

Method of Forming Threads	Fig. 1 		Fig. 2 		Fig. 3 	
Tolerances	Zinc	Aluminum Magnesium	Zinc	Aluminum Magnesium	Zinc	Aluminum Magnesium
Minimum pitch or maximum number of threads per inch	32	24	32	24	20	16
Minimum O.D.	3/16"	1/4"	3/16"	1/4"	1/4"	1/2"
Tolerance on thread lead per inch of length	±.005"	±.008"	±.005"	±.008"	±.005"	±.008"
Minimum pitch Diameter Tolerance	±.004"	±.005"	±.005"	±.006"	First 1/2" ±.002" Each additional 1/2" ±.001"	±.003" ±.001"
Other Factors	***Fins formed on threads must be removed by trimming or chasing***		***Additional trim necessary to remove flash formed by slides***		***Ejection requires unscrewing of die or die casting***	

NOTES: Apply direct tolerances shown wherever possible rather than specifying thread class or fit.

The values indicated include parting line, moving die part, and linear dimension tolerances, as required.

For Design Considerations and Internal Die Cast Threads See Part 2

PRODUCT STANDARDS FOR DIE CASTINGS

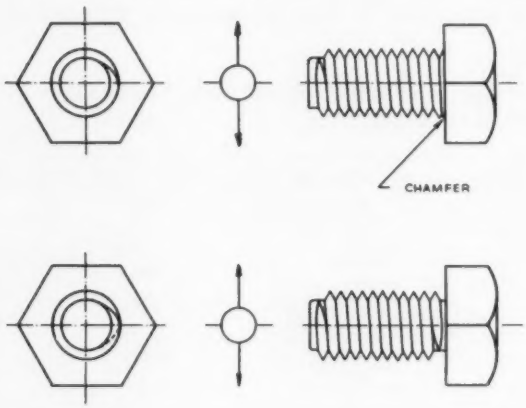
ADCI-E14-59T (Part 2)
DIE CAST THREADS
(Design Considerations; Internal Threads)

NOTE: The data shown herein represent normal production practice at the most economic level. Variations from recommended thread designs or tolerances should be specified only where and when necessary since additional cost may be involved.

DIE CAST THREADS — (Page Two)

Design Considerations

The recommended *designs* for terminating a die cast *external* thread are shown in the illustrations.



Internal Threads

Die cast internal threads require the use of a solid die component or core which must be unscrewed from the die casting (or the die casting unscrewed from the core). Due to the shrinkage of the die casting around the threads, considerable force must be used to unscrew the die core from the die casting. Draft is usually required on the thread *major*, *minor*, and *pitch* diameters which tends to reduce the usefulness of the die cast thread.

In view of the problems connected with die casting internal threads, they are not generally die cast in aluminum or magnesium and should be considered to be special cases in zinc alloy to be reviewed with the die caster before specifying.

For External Die Cast Thread Tolerances See Part 1 of This Standard

COMPLETE ADCI "E SERIES" STANDARDS AVAILABLE

The American Die Casting Institute has prepared a series of engineering standards known as the "E Series" Product Standards For Die Castings. These standards cover many of the aspects of preferred design for die castings to give the best part at the lowest manufacturing cost. They are intended primarily for the design engineer so that he can incorporate the most desirable casting features into his design.

The complete "E Series" is listed below. Individual copies of single standards may be secured from any jobbing die caster who is a member of ADCI or the complete set may be purchased from:

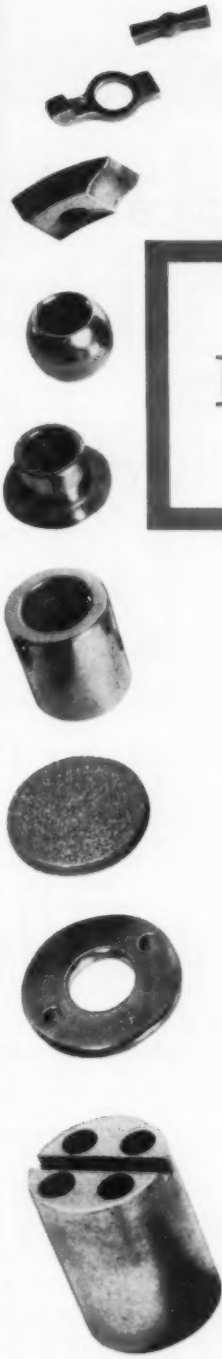
PRECISION METAL MOLDING
812 Huron Road
Cleveland 15, Ohio
or
American Die Casting Institute
366 Madison Avenue
New York 17, New York

The price of the complete set of standards is $5.00, and remittance should accompany your orders.

E1-55T, Linear Dimension Tolerances
E2-55T, Parting Line Tolerances
E3-55T, Moving Die Part Tolerances
E4-55T, Draft Requirements for Walls
E5-55T, Flatness Tolerances
E6-55T Depth of Cored Holes
E7-55T Draft Requirements in Cored Holes
E8-55T Cored Holes for Tapping
E9-55T Ejector Pin Marks
E10-55T Flash Removal
E11-55T Angularity Tolerances
E12-57T Concentricity Tolerances
E13-55T Machining Stock Allowance
E14-59T Die Cast Threads
E15-59T Fillets, Ribs & Corners
E16-59T Lettering and Ornamentation

HOWE SOUND BUYS CRUCIBLE, WAIMET

HOWE SOUND CO. has purchased certain assets of CONSOLIDATED FOUNDRIES & MFG. CORP., including CRUCIBLE STEEL CASTING CO., Milwaukee, and WAIMET ALLOYS CO., Detroit. Both firms will operate as Howe divisions.



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SINTERINGS

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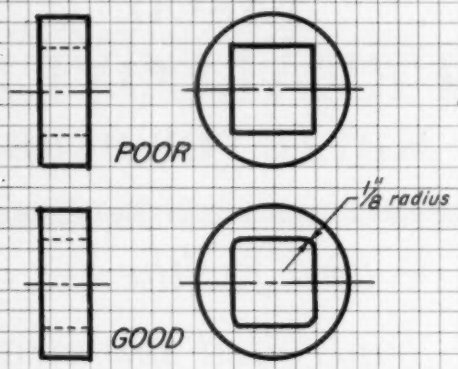
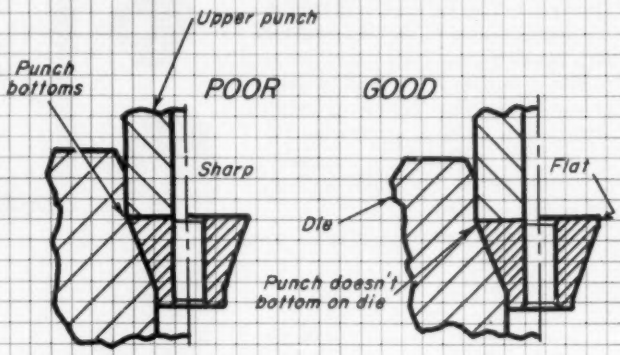
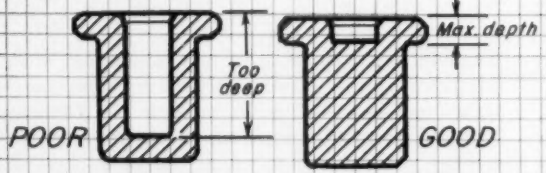
Good Design vs. Poor Design Practice



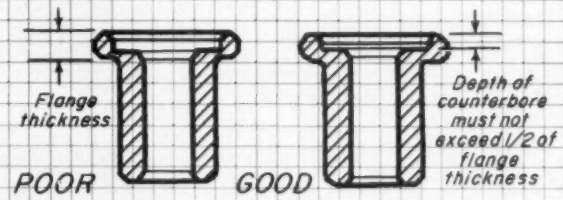
A radius on an internal corner produces a strong part, whereas a sharp corner creates a point of incipient stress failure.



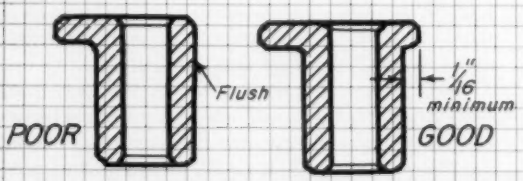
Elimination of sharp corner on work piece also reduces die wear and possible breakage.



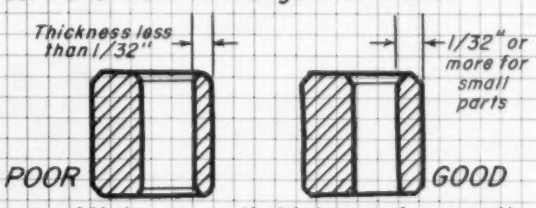
A blind hole in a flanged part should not be made deeper than the flange thickness.



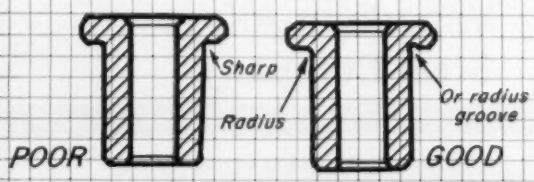
Counter bore should be limited to one-half of flange thickness.



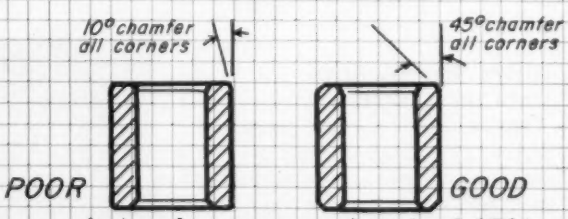
With variable flange overhang, the minimum that can be tolerated is 1/16".



Minimum wall thickness for small parts is 1/32". Large parts should be proportionately thicker.



A sharp corner structurally weakens the part and shortens die life.



A chamfer or corner break of 45° is required consistent with tool life, therefore economical production.

Courtesy of The Bunting Brass and Bronze Company

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The *all new* KUX die casting machines are available with Vac-U-Die Vacuum Die Casting System

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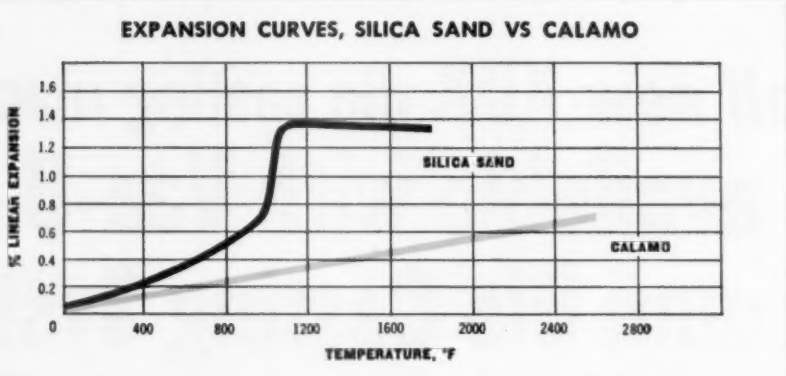
for metal casting



Calamo for Investment Molds

CALAMO, one of the extensively used Harbison-Walker products for molding is an alumina-silica refractory of optimum sizings for various molding mixtures. Its fusion point is 100°F. higher than that of normal silica sand mixes.

The chart above shows the exceedingly desirable expansion curve of CALAMO as compared with that of silica sand.

CALAMO, used as the major constituent of precision casting investment mixes, improves the dimensional constancy of the molds, makes them stronger and more resistant to erosion by metal flow. Investment costs are measurably reduced because an appreciably lesser amount of bonding agent is needed. This is attributable to the very desirable particle sizing and the equiaxed, dense grains of CALAMO.

CALAMO, used alone or as the major part of conventional dry sand molding mixes in rammed or in slinger-placed sand molds, provides not only the very desirable low thermal expansion characteristics particularly suited for precision casting but also provides the required refractoriness for melts and alloys melted at unusually high temperatures.

H-W Flintgrain for Ceramic Shell Molds

H-W Flintgrain is an alumina-silica refractory, similar in composition to CALAMO, having the same very desirable low thermal expansion characteristics, but greater angularity of grain shape.

The angular grain shape and optimum size distribution make H-W Flintgrain ideal for securing maximum compactness in the mold. It is used with special benefit for making ceramic shell molds and for similar applications in which dense, compact mold sections of greatest volume stability at all temperatures, are of paramount importance.

Illustration of angulate shape of H-W Flintgrain (x 3)

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PMM

The specialized finishing methods, equipment and materials used to machine, assemble, surface condition or surface coat precision metal molded parts are presented here. This includes all secondary operations which convert a raw casting to a finished product.

Finishing Section

Multiply corrosion resistance by . . .

Plating with Duplex Chromium

By DR. EDGAR J. SEYB, JR.*

FOR MANY YEARS the plating industry has been searching for an economical way to produce bright chromium deposits with increased resistance to outdoor exposure.

With the standard 0.01-mil (0.00001-in.) deposit of chromium commonly specified in the automobile industry for the last 25 years, failures are common in 16-hour Corrodekote or CASS (copper-accelerated acetic acid salt spray) tests. Until recently, it has not been possible to increase the thickness of the chromium without causing high surface stresses. These produce deep cracking and a consequent rapid reduction in corrosion resistance.

In 1953, Metal & Thermit introduced Unichrome crack-free chromium CF-500 bath for producing a thicker and more corrosion-resistant deposit without cracking. (see PRECISION METAL MOLDING, June, 1955; pg. 67) The deposit produced with this bath had a satin finish suitable for industrial purposes. However, it had to be buffed for decorative use.

In view of the outstanding wear and corrosion-resistant results obtained with this bath, further research was conducted, resulting in development of the Unichrome bright crack-free CF-520 bath. In addition to producing thicker bright deposits with no cracks, it had unusual covering and throwing power.

Research was conducted on both cracked and crack-free chromium. And, a special operating procedure using SRHS formulation CR-110 was developed to produce a unique crack pattern. Plated over a crack-free CF-520 chromium deposit, the combination has an unusual structure which greatly improves corrosion resistance.

*RESEARCH SUPERVISOR
ELECTROCHEMICAL RESEARCH LABORATORY
METAL & THERMIT CORPORATION

WHAT IT IS

In developing this successful duplex chromium process, many combinations of deposits were plated and evaluated. The M & T research led to the combination of crack-free CF-520 and SRHS Special CR-110 chromium, capitalizing on the advantages of each.

The result is the Duplex Chromium process, consisting of an initial application of bright crack-free CF-520 chromium for optimum coverage and build-up in low current density areas, followed by a second bright deposit of finely cracked chromium from a specially operated CR-110 bath. Neither deposit has to be buffed.

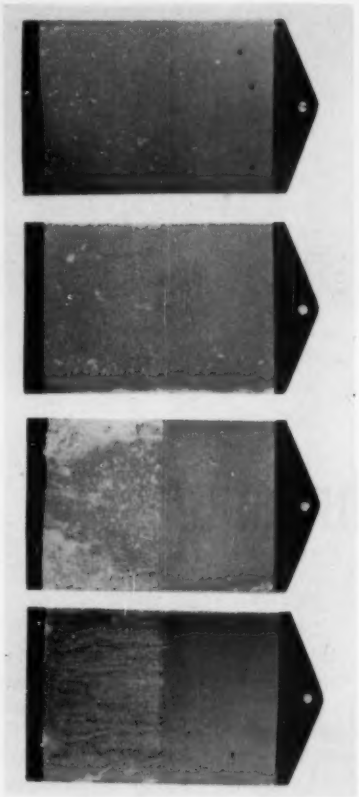
SRHS Special CR-110 chromium also has been applied over ordinary chromium, but with only limited success. This combination is not as effective because ordinary chromium deposits do not have the ability of CF-520 to provide better coverage and freedom from cracks in deposits thicker than 0.01 mil.

The corrosion of plated automotive trim parts, which has caused much concern, is due to the rapid pinhole rusting and blistering caused by electrolytic cell action. This is the reverse of depositing metals – that is, the corrosion is a stripping action where the rate of penetration and removal of metal depends on the cell potential.

The higher the voltage (cell potential), the more rapid the rate of stripping and, therefore, of corrosion. Since electroplated metals normally do not bridge defects, a few isolated spots corrode rapidly because all the cell potential is concentrated at these defective spots.

When a finely-cracked chromium is deposited on top of the crack-free chromium, there is a very low rate of corrosion – or none at all. This is because the many cracks over the entire surface disperse the cell

continued on next page



CHROMIUM	CASS TEST HOURS	ASTM RATING	CORROSION %
0.01 MIL ORDINARY	36	4	2.5-5
0.05 MIL DUPLEX	136	6	0.5-1
0.10 MIL DUPLEX	460	6	0.5-1
0.20 MIL DUPLEX	483	9	<0.1

UNDERCOAT: 0.75 MIL COPPER, 0.75 MIL NICKEL

NOTE: IN LONG-PERIOD CASS TESTS, A WHITE SCUM FORMS. THIS IS NOT RATED AS CORROSION, AND HAS BEEN WIPED TO SHOW ACTUAL BASIS METAL CORROSION.

FIGURE 1. CASS TEST results on zinc base die castings.

action over a large area. Therefore, there is a substantial reduction of the current density at each of these many individual openings. This keeps the current density below the value corresponding to the critical potential required for the anodic perforation of the underlying metals.

While a single thick layer of crack-free chromium upgrades corrosion protection significantly, a second deposit of finely-cracked chromium has been found to provide even greater benefits, extending the CASS test performance with 0.1 mil of chromium to approximately 200 hours. Corrodekote tests, normally stopped after one cycle, had to be run six complete 16-hour cycles to reach the same degree of failure.

It is more difficult to protect zinc-base die castings than steel, due to the fact that they contain more voids and imperfections. Plating baths cannot bridge all the surface imperfections. However, the Duplex Chromium process is producing improvements of 100 percent or more in corrosion-resistance on regular production-run die castings.

For example, one large die casting plater, who formerly plated with 0.01 mil of chromium on normal undercoats, had only 10 percent of his parts pass a 16-hour CASS test. Now, with Duplex Chromium, over 80 percent of the parts pass a 32-hour CASS test.

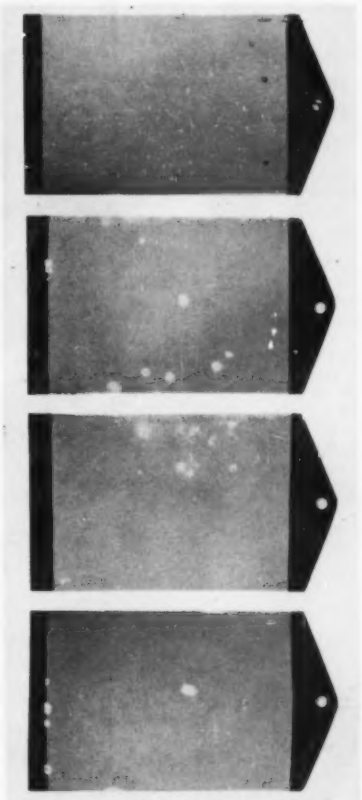
Major producers of electroplated parts for the automobile industry are now using Duplex Chromium in production. Many others are known to be studying the process.

HOW IT'S APPLIED

In the Duplex Chromium plating installations now running, the procedure is to plate a minimum of four minutes with CF-520 chromium at an average current density of 1½ ASI, 8 volts, and 120° F tank temperature. This is followed by a reclaim rinse and one water rinse. Next is another five minutes in SRHS Special CR-110 solution at about the same current and tank temperature, at 7½ to 8 volts.

This procedure puts on about 0.1 mil total chromium in the average current density areas, with far greater thickness in the low current density areas than previously possible, and without burning in the high current density areas.

If available equipment does not have enough length for a second chromium tank, a separate tank can be used for the SRHS Special CR-110 solution. If the



CHROMIUM	TEST CYCLES	ASTM RATING	CORROSION %
0.01 MIL ORDINARY	2	4	2.5-5
0.05 MIL DUPLEX	6	6	0.5-1
0.10 MIL DUPLEX	10	7	0.25-0.5
0.20 MIL	21	8	0.1-0.25

UNDERCOAT: 0.75 MIL COPPER, 0.75 MIL NICKEL

FIGURE 2. CORRODEKOTE TEST results on zinc base die castings.

work dries between these operations, it should be cleaned by soaking for 3 to 5 minutes at 180° F without current in an alkaline electro-cleaner. This is followed by two cold-running water rinses, then the final chromium plating operation.

With ordinary baths, 150 ASF is the usual maximum current density permissible without burning the chromium. With CF-520, platers have run as high as 420 ASF with no observable burning. However, it also is possible to plate successfully as low as 120 ASF. This unusually wide bright plating range makes it practical to produce bright deposits in recessed areas without burning at high current density points.

An additional production advantage of the Duplex Chromium process is the ability to re-plate rejects, which cannot be done with ordinary baths. And, because of the excellent throwing power of CF-520 for the chromium undercoat, auxiliary anodes rarely are required.

The ordinary high ratio (175/1; CRO_3/SO_4) bath used to produce crack-free chromium in laboratories has not proved practical in production because of misplates and brown stains on the nickel, and with little or no chromium in recesses.

In one plant, a number of automatic machines for plating exterior zinc die castings have been converted to CF-520 to get increased chromium thickness specifications. Second chromium tanks for CR-110 were installed. The plating time in each bath varies, but in no case does it exceed 10 minutes total in both baths.

In some machines, these changes are made by simply removing the drier from the machine and using this space for the additional CR-110 tank. The drier is then set up on the conveyor line that removes the parts from the machine.

A large manufacturer of bumpers is planning to add an auxiliary chromium plating machine to his present installation in order to use Duplex Chromium. He found he could raise the chromium thickness in his minimum current density areas from 0.006 to 0.021 mil by changing his ordinary high-temperature, high-ratio bath to CF-520 in the existing machine. The auxiliary machine will be used for CR-110 only.

To summarize, cost figures indicate that for money invested in equipment and solutions, this new technique provides far greater benefits in terms of corrosion resistance than a corresponding expenditure for the production of undercoats.

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DIE CASTING STEEL

continued from page 58

ments of this new set-up are the shot-sleeve, which has a conical, threaded end, and the mating sleeve-valve which is screwed onto it. This latter has a port which normally alines with a similar port in the sleeve itself as shown. In this position, metal can be ladled into the sleeve.

After this operation, the sleeve-valve is given a quarter-turn, which both seals the shot-sleeve from the outer air and brings into line with the inner port a pipe which, as indicated in Figure 2, is connected with a vacuum-pump system. This same motion of the sleeve-valve brings it firmly up against the outer end of the shot-sleeve, forming a seal around the plunger-tip.

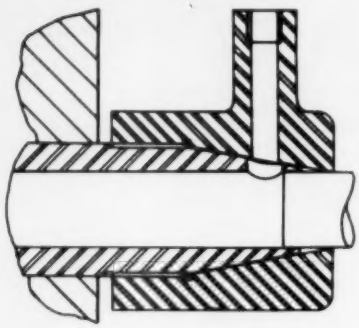

FIGURE 2.

As the rotation of the sleeve-valve is completed, the valve of the vacuum-line is opened and the air in the cavity is rapidly evacuated. At virtually the same moment, the injection stroke of the plunger begins, for evacuation of the die requires only a fraction of a second by this method.

The main shortcoming of this method is that it cannot be effectively employed with dies having moving cores, which have so much play in their housings (if not initially, invariably after the die has been in service some time) that air leaks back into the cavity too fast and injection takes place at an inadequately reduced pressure. To obtain a satisfactory pressure reduction with complicated dies requires a more elaborate set-up in which, as depicted in Figure 3, the die is completely shrouded by a sealable hood.

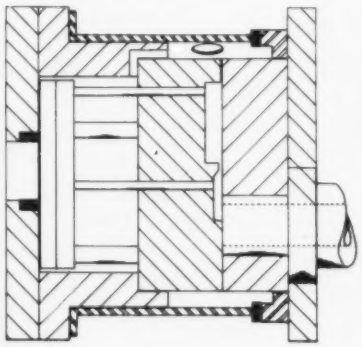

FIGURE 3.

This is itself directly evacuated, as in the method first described. Additionally, the air within the cavity is abstracted by way of venting channels, along the cores and ejectors, as well as into the free space above the charge of metal. Because of the greater volume of air to be sucked out, the time for evacuation is extended. Nevertheless, it is completed in about one second.

The sealable hood is formed in two parts, the larger being attached to the bolster or ejector-box upon which the moving member of the die is mounted. Similarly, the mating portion of the hood is attached to a back-plate upon which the fixed member of the die is mounted. The two portions of the hood meet in a resilient seal. Within a vacuum chamber so formed it is possible to mount dies of a simplified type (i.e., not incorporating their own vacuum seals.—ed.) and to change them quickly.

continued on page 78

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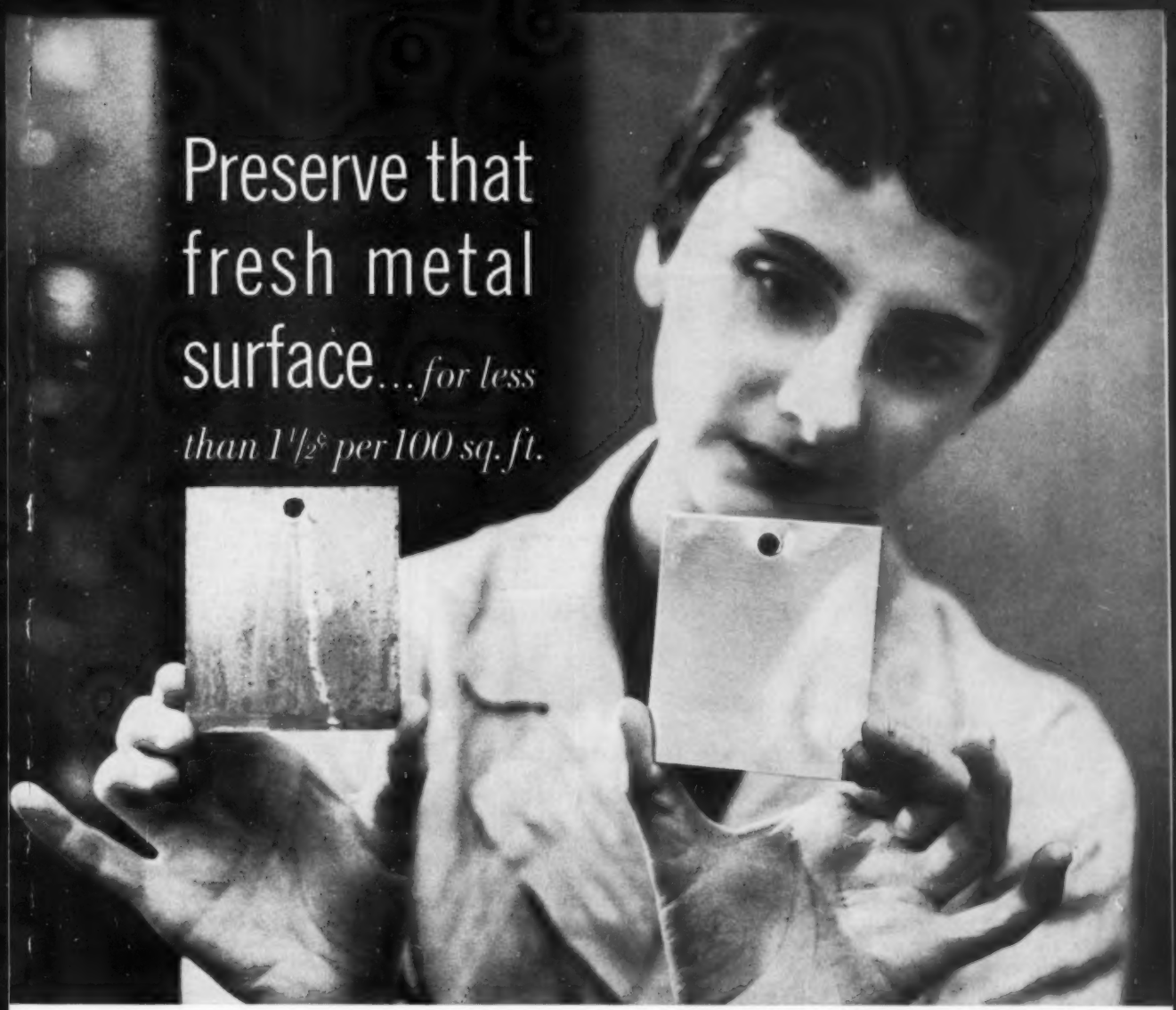

Compare treated vs untreated brass panels. After cleaning, panel on right was rinsed in Entek 45 rinse; panel on left, in standard hot water rinse. Then panels were exposed to 100% humidity at 100° F. for 100 hours. Note how Entek 45 preserves "that fresh metal surface."

From Enthonics research come Enthone Enteks, a new series of rinse water additives which coat metal surfaces with an "invisible shield" against the atmosphere. Entek 45 assures faster drying, eliminates water spots and provides lasting corrosion protection to all metals. Entek CU-55 prevents tarnishing and spotting out of copper and brass even under tropical humidity conditions.

By adding Entek 45 to your final hot water rinse, you can prevent white salt corrosion of zinc and aluminum, prevent yellowing of nickel plate, prevent tarnishing of copper and brass, prevent black spots on cadmium plate.

By treating copper and brass goods or copper or brass plated items with Entek CU-55 you can prevent tarnishing, green salt formation, spotting-out and pit corrosion under high humidity storage conditions.

Entek protection lasts for months, yet costs less than 1½¢ per 100 sq. ft. to treat your parts, less than ½¢ per gallon to make up an Entek 45 solution!

Entek 45 produces an invisible, water-repellent organic film on the metal surface which sheds water rapidly and promotes stain-free drying. This same film acts as an invisible barrier between the metal and the moisture and oxygen in the air.

Entek CU-55 reacts with copper and copper alloys to form an invisible layer which has many times the corrosion resistance of bare copper and brass. Additionally, this layer has better solderability and improves adhesion of lacquers and enamels.

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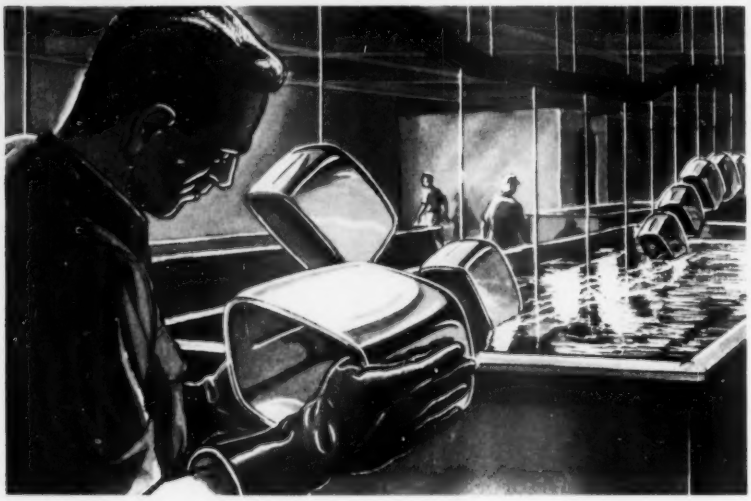

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Just a little Oakite Rinsite in the final rinse after plating cuts rejects due to water spotting and staining. How? Rinsite "thins out" the rinse water, makes it drain more quickly, more completely.

While it leaves no drops to cause stains or tarnish . . . it *does* leave a thin, non-oily, invisible film that not only gives plated parts extra sparkle, but also protects against indoor rust.

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This liquid rinsing aid is just one of a line of Oakite materials to help avoid plating rejects. There are hard-working pre-cleaners . . . precision electro-cleaners for various metals. If you're interested in *results*, ask Oakite. Send today for Bulletin F-9822. Oakite Products, Inc., 34G Rector Street, New York 6, N. Y.

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DIE CASTING STEEL

continued from page 76

When setting up, the back-plate is bolted to the fixed platen, being located upon the projecting flange of the shot-sleeve. The fixed die member is next located upon the projecting spigot of the shot-sleeve and is bolted to the back-plate. The moving member being engaged by means of register pins to the other half of the tool, the main portion of the hood can be bolted to the moving platen. When changing dies, the hood can remain in place on the platen.

Among the defects of this design, one must cite the difficulty of setting up the moving die member inside the hood, and the non-universality of the whole method of using a rigid sealable hood, which entails the use of dies having an invariable overall thickness. In the methods described below, these faults have been eliminated.

An improved method of evacuating the air is illustrated in Figure 4. In this, the shot-sleeve is assem-

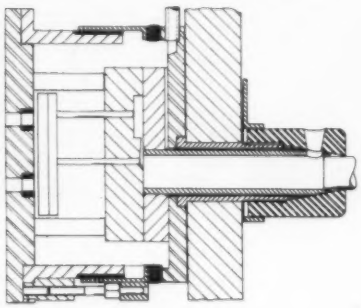


FIGURE 4.

bled together with an outer jacket, the latter being flanged where it projects through the fixed platen. Between the jacket and the sleeve, channels are formed by machining grooves on the inner and outer surfaces respectively. The back-plate upon which the fixed die-member is mounted has a slot in its face which runs vertically down behind the die-member and connects with the channels of the sleeve assembly. When air is evacuated from within the hood, it is also drawn (by way of the slot, the grooves, the free space above the charge of metal and, finally, the runner channels) from the cavity itself.

A vacuum system of this sort was

set up on a Reed-Prentice 1½ G die casting machine for the die casting of steel components. Because of the severe service conditions, readily interchangeable hobbed inserts were used for the cavity. The fixed die-member being mounted on its back-plate and the moving member upon a supporting bolster, the latter is bolted to the moving platen.

The cylindrical vacuum chamber is now slipped over the moving die-member and secured to the bolster, being clamped down hard onto a sealing ring. The machine is closed and the locking pressure on the die-faces adjusted, the vacuum chamber meanwhile being kept in its most retracted position so that there is a small gap between its forward edge and the annular seal on the face of the mating ring forming part of the back-plate.

With the locking pressure adjusted, and the vacuum pump working, the loose ring forming the intermediate portion of the vacuum chamber is advanced by jack-screws until it contacts the annular seal on the back-plate. The screws are adjusted until an adequate depression is registered on the vacuum manometer. The provision of this means of adjustment for the vacuum chamber not only assures that a good seal can be obtained, but also makes it possible to use dies of varying overall thickness.

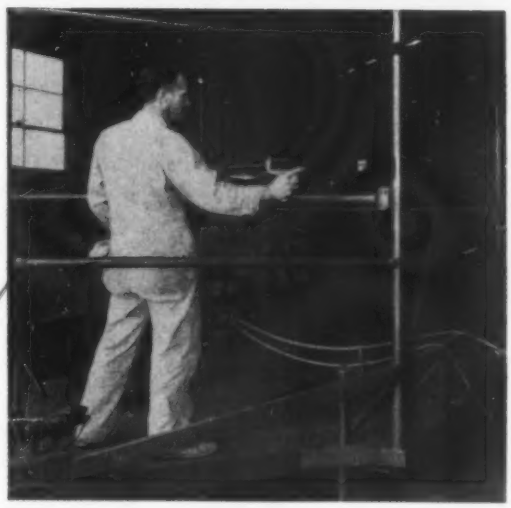
The annular seals and the peripheral seal are cut from sheet rubber, and the push-rods actuating the ejector-plate pass through rubber bushes where they come through the moving platen.

Evacuation of the vacuum chamber may be accomplished either by a directly-coupled pump, or by a pump with a large intermediate evacuable receiver. If the volume to be evacuated is V ft^3 and the capacity of the pump is S_n ft^3/sec at atmospheric pressure, then the time required to obtain a drop in pressure to 1/25 inch of mercury (assuming the connecting channels to be short and not constricted) is approximately given by the formula $t = 8V/S_n$, t being in seconds.

This formula allows the calculation of the time to be allowed for evacuation if the pump characteristics are known, or alternatively enables one to choose a pump having

continued on next page

FASTER . . . CLEANER . . . MORE ECONOMICAL WHEN YOU PAINT WITH THE RANSBURG Electrostatic Hand Gun



Gator Boat transport trailers are painted in less than half the time—with half the paint—with the new Ransburg Electrostatic Hand Gun.

For instance

Peterson Bros., Inc., Jacksonville, Florida and Ft. Wayne, Indiana, world's largest manufacturer of boat trailers for the Marine Industry, switched from air hand spray to Ransburg No. 2 Process Electrostatic Hand Gun at the Fort Wayne operation in the finishing of their big custom line boat trailers and their Gator line of Marine Trades Equipment.

Paint saving with the Ransburg Hand Gun is estimated at 50 to 60% over the former method. Construction of their products (they use a lot of tubular steel) is ideal for Hand Gun application because of the "wrap-around" characteristic of Electro-Spray.

Painting is done now in an open spray room where two water-wash booths stand idle. Not needed! Maintenance in the paint room has been reduced 75%, for where they used to have to clean up the room sometimes twice a week (mostly on overtime) it now goes two or three weeks without cleanup.

One of Peterson's biggest products now painted electrostatically is a boat transport trailer, Model 807, built to haul six 16-ft. runabout boats. The trailers are over 31-feet long; overall height is 11'-2" and almost 8' wide. With air spray, it used to take 8 hours, or more, to paint the big vehicles. Now, with Ransburg No. 2 Process Electrostatic Hand Gun, one operator does the job in only 3½ hours. And, with half the paint!

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RANSBURG

RANSBURG Electro-Coating Corp.

Box-23122, Indianapolis 23, Indiana

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DIE CASTING STEEL

continued from page 79

an adequate capacity when the maximum allowable duration of evacuation is predetermined. When pressure die casting steel components under vacuum, the maximum time allowable for evacuation is between one and one-half seconds.

As in pumping air in, when pumping it out, the pressure differential achieved in a given time is a function of the form and cross-section of the narrowest part of the channel – in the case of a die casting die, this is generally the gate. To obtain a satisfactorily reduced pressure quickly with a direct-coupled pump requires a high-capacity pumping unit; by utilizing a vacuum reservoir adjacent to the space to be evacuated, a much lower-powered pump can be used, since the whole duration of the casting cycle is available for the evacuation of the reservoir.

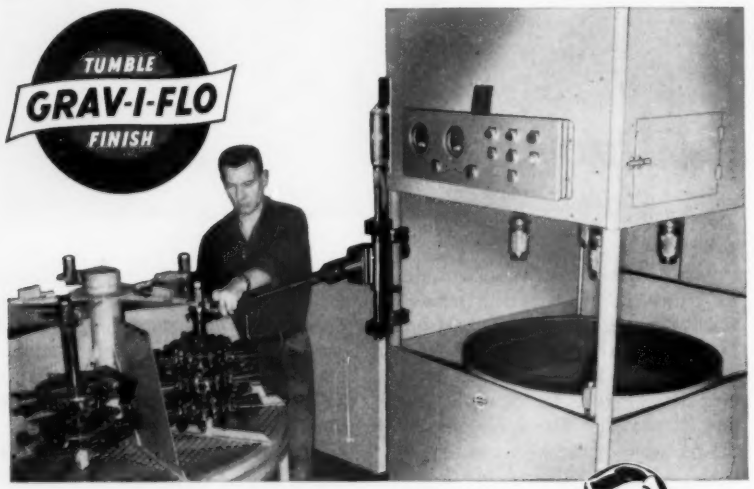
Our experience in operating vacuum die casting installations prompts certain practical recommendations. The first is that, at the moment of pouring the molten steel into the shot-sleeve, there is a possibility that splashed drops of metal may penetrate between the end of the sleeve-valve and the rear face of the platen. In this case, the valve jams, the clearance between the valve and the sleeve is not taken up, and the pressure in the system is not adequately reduced because air is getting into the shot-sleeve.

To avoid this, we fit to the end of the sleeve-valve nearest the platen a wide, thin flange as shown in Figure 4. Secondly, the vacuum-line issuing from the chamber should not be opposite the venting-channels ground in the face of the die, or it may happen that at high operating speeds, or with high injection pressures, metal will penetrate right along the vents and be sucked into the vacuum-line, causing partial blockages that increase the evacuation time.

When die casting steel, the shot-sleeve and its jacket must both be readily interchangeable, as also must the plunger-tip. It is not essential to fit rings to plunger-tips; the clearance between plunger-tip and shot-sleeve (also between shot-sleeve and jacket) should be from 0.025 mm. to 0.050 mm. (0.001 - 0.002-in.). With a clearance in excess of 0.050 mm., the rate of infiltration of air into the space ahead of the plunger becomes great, and the effectiveness of evacuation diminishes.

However, if the clearance is reduced below 0.025 mm., the plunger may seize despite the fact that it is water-cooled, for the tip necessarily expands in contact with the molten steel. With the clearance between the indicated limits, a gauge reading of from 40 to 20 mm. of mercury should be obtained.

All the parts of the system in contact with the molten steel – plunger-tip, shot-sleeve, runner-channels, and cavities – must be periodically lubricated with No. 5 silicon fluid containing powdered bronze. The lubricant should be applied with a spray and must be renewed every two or three shots. Excessive lubrication results in the occurrence of porosity. Vacuum pumps Model VU 1 and VU 2 are simple, rugged types suitable for this application; they can be utilized with all types of machines having a horizontal injection stroke.



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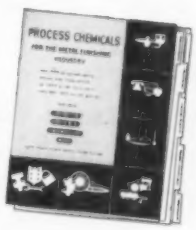

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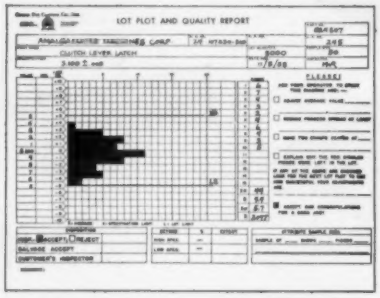

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continued from page 10

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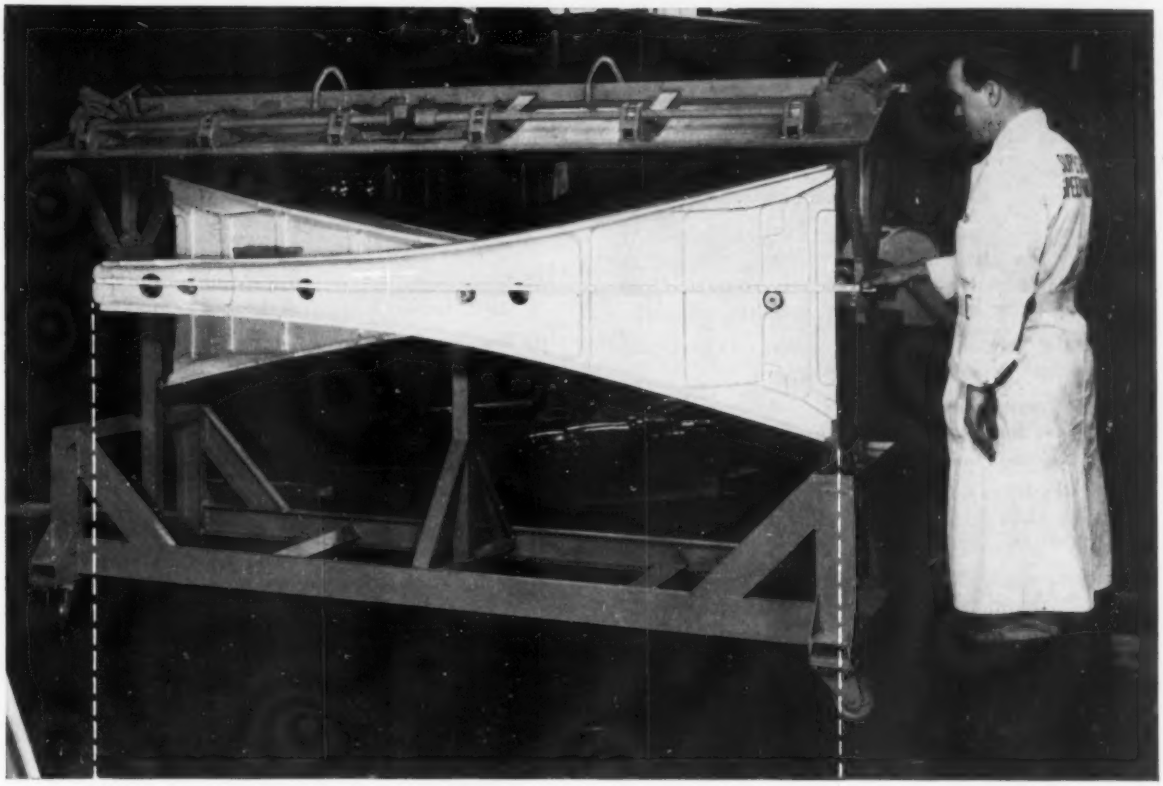

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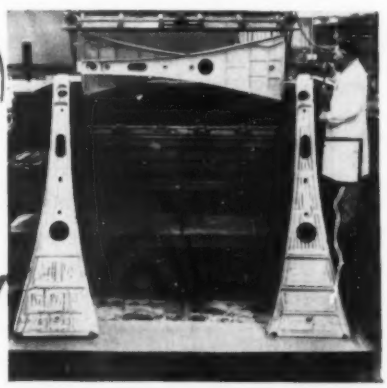
Note "machining ridges" on foreground spars, prior to Almco Barrel Finishing. Supersheen Aluminum Oxide chips with Almco #10 compound are used in 2 hour finishing cycle.



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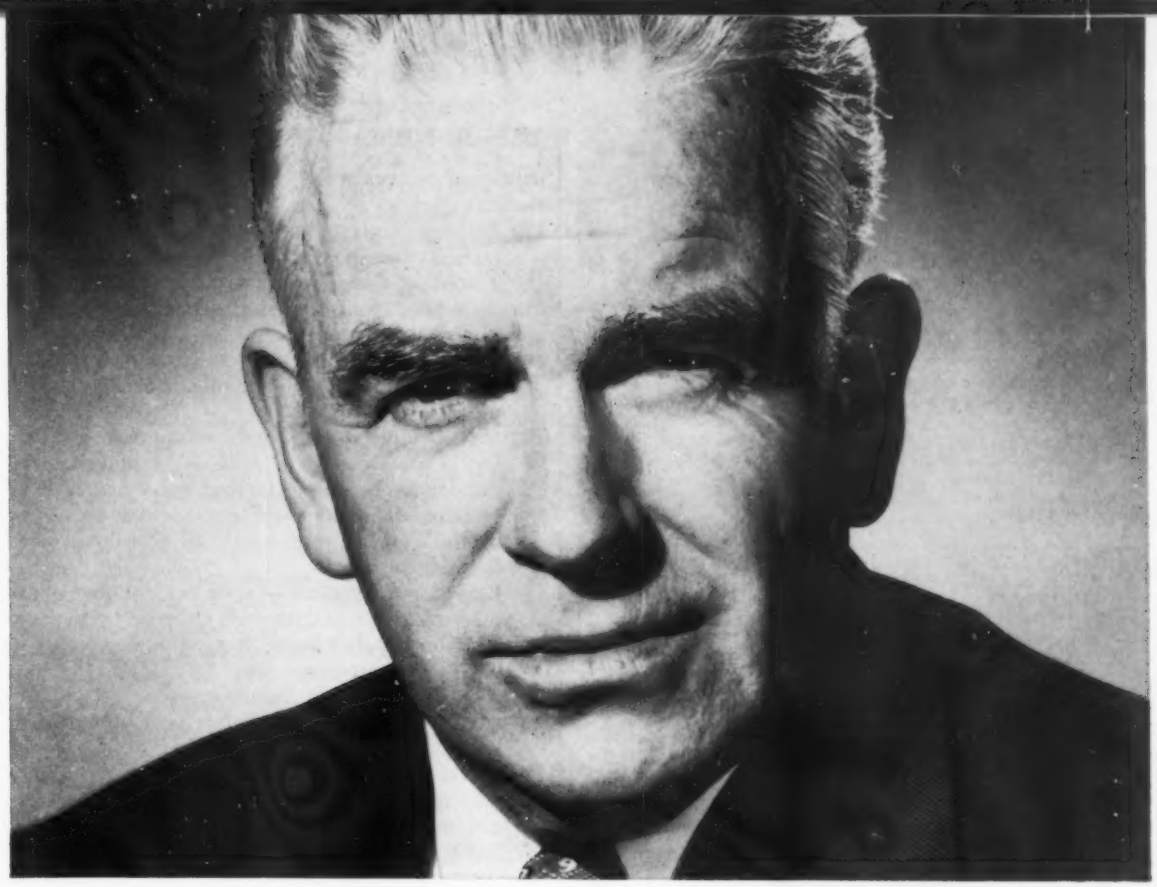

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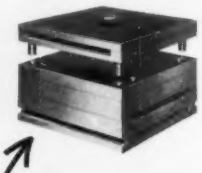

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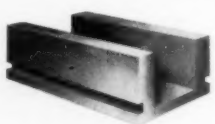

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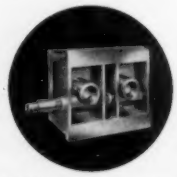

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182 Belt Grinder — HAMMOND MACHINERY BUILDERS, INC. — Specs on Model UBG-50, a universal belt grinder for polishing, buffing, deburring.

183 Horizontal Tumbler — BAIRD MACHINE CO. — Specs on the Finishmaster, a 30 x 46 horizontal barrel finishing machine.

184 Finishing Literature — MAC DERMID INC. — Summary of technical data sheets offered by the company on metal cleaners, conversion coatings, copper plating processes, etc.

185 Electrostatic Spray Painting — IONIC ELECTROSTATIC CORP. — Technical data on electrostatic spray systems and equipment.

186 Barrel Finishing — CASALBI CO. — Technical literature on Globe Burr-Rite horizontal barrel finishing machines.

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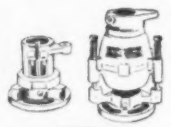
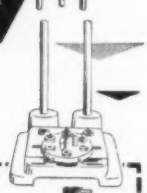


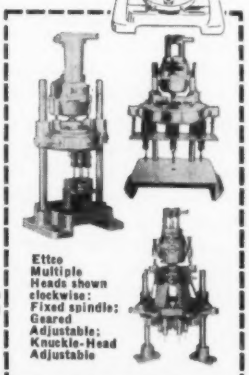
ETTCO-EMRICK MULTIPLE SPINDLE HEADS

UNIT-ENGINEERED *for drilling or tapping on any drill press*



No one type will do for every job. That's why we make 'em all—and the correct custom tooling for faster handling of the parts. The Ettco system is a completely integrated service; not just multiple heads with spindles reaching into the air!

Ettco engineers can tell you without obligation which type best suits your specific job. They're all easily attachable to your present drill press, tapping machine or automated special. Standardized, reuseable components mean lowered costs. Interchangeable face plates permit quick switch from tapping to drilling. Write for catalog.



Ettco Multiple Heads shown clockwise: Fixed spindle; Geared Adjustable; Knuckle-Head Adjustable

Send us a sample part or drawing for recommendations now!

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The only complete line manufacturer of drilling & tapping equipment for the entire small hole field

See your authorized Ettco distributor

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188 **Protective Coating** — CONVERSION CHEMICAL CORP. — Technical data on Kenvert-O-Color process, a method for applying colors and corrosion protection to non-ferrous metals.

189 **Immersion Heater Guide** — GENERAL ELECTRIC CO. — Guide shows how to select correct immersion heater for plating-bath heating.

190 **Finishing Systems** — GRANCO, INC. — Catalog shows spray booths, washers, dryers, and other industrial finishing systems.

191 **Barrel Finishing Literature** — ALMCO-QUEEN PRODUCTS DIV., KING-SEELY CORP. — Kit contains technical literature on barrel finishing machines, methods and media.

192 **Chemical Deburring** — MAC DERMID INC. — Technical data sheets on chemical deburring solutions and polishes for zinc base die castings.

193 **Liquid Plastics** — BEE CHEMICAL CO. — Technical data on liquid plastisol type plastic for vinyl clad steel or aluminum.

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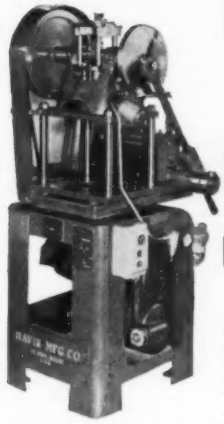

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HAVIR

(formerly Diebel)

Expanded Bed PRESSES

You can utilize the full tonnage of these expanded bed presses to cut your die trimming costs to a minimum. Available in 8 Ton with 12"x12" bed; 12 Ton with 12"x14" bed; 16 Ton with 12"x14" bed.

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Sales Service practical engineers will recommend the right press for your die trimming jobs at no obligation. Ask your PRESS-RITE or HAVIR Dealer or write direct.

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Make significant reductions in waste, scrap, and time-consuming production operations and, at the same time, improve the quality, uniformity, accuracy and versatility of your machine parts and bearings.

Use of powdered metals permits forming of many parts to finished dimensions, reducing the need for machining operations which normally generate scrap. It is often possible to redesign parts so that they can be fabricated from metal powders with sizeable savings in ultimate production costs.

Parts are produced faster and easier. Density, strength, porosity and self-lubrication of the finished part can be planned in advance, and controlled throughout production. In addition, many multiple operations can be eliminated.

Get the MD Representative into your production planning! He is familiar with the multitude of different applications of metal powders and will be glad to supply you with a list of qualified fabricators.

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METALS DISINTEGRATING COMPANY, INC.

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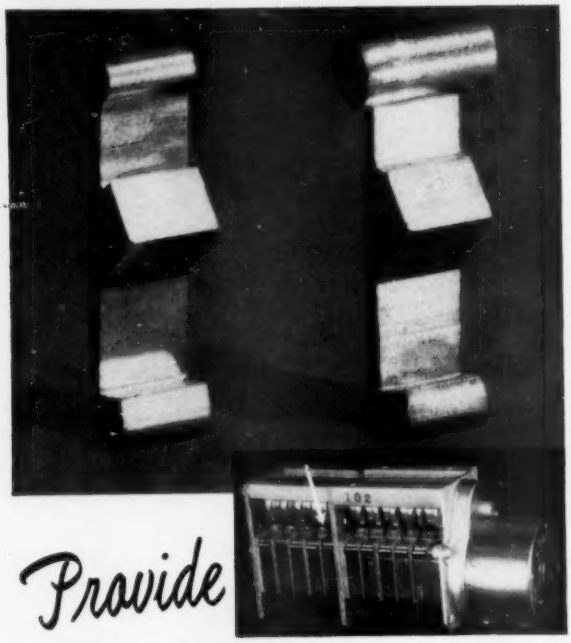

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Such complex multiple parts for custom-designed repeat cycle or sequential timers require the best of materials and workmanship. Designed to be made of nickel silver by the powder metallurgy process*, they are not only low in unit cost, but provide:

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THIS BOOKLET

will assist you in evaluating this modern production method in terms of your particular needs.

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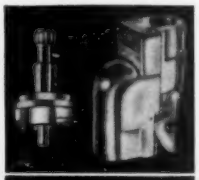
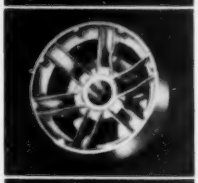
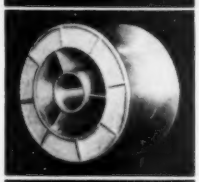
You can depend on Litemetal Dicast, Inc. for correct metallurgical recommendations and the skilled die construction required for special product demands



Shown here are two non-conventional examples of die construction where special tolerances are provided, as in this Automotive Window Regulator Shaft (left) and Slide Coupling (right) built to withstand hydraulic bursting pressures.



Here is an example of where hypereutectic silicon alloys were chosen for their wear-resistance qualities (comparable to cast iron), for applications in brakes, cylinders, etc.

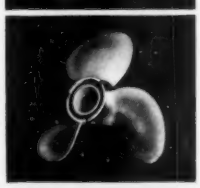


Low silicon alloys are chosen for their ductility and bend-ability in such products as the spool shown.

SERVICE • with • SKILL

Aluminum can be die cast into hardware quality and commercially plated for decorative, finished products as in this vegetable shredder where light weight is essential.

The ultra light weight of magnesium makes it ideal for casting items such as chain saw parts where weight-saving is vital.



Products, like this propeller, are successfully die cast from ALMAG, which is known for its corrosion resistance, high strength and brute toughness.

Additional facilities offered by LITEMETAL include plating and finishing to hardware standards through affiliated sources, placing at your disposal an integrated time-saving service, coupled with LITEMETAL skill and efficiency.

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Foundries Can Cut Costs Too

By M. F. WENDT*

THE DESIGN ENGINEER isn't the only one charged with getting the cost of component parts down. The foundry has its share of responsibility, and every measure taken to lower production costs should be reflected in lower piece costs to the customer.

Such a seemingly simple operation as mixing and blending the components in the investment material can have a large effect on cost of the finished casting.

A ceramic mold requires intimate blending of three chemical binders with silica sand. Improper or non-uniform mixing results in rejected castings and cracked molds. With a mixer using revolving ribbon paddles in a stationary compartment, blending was non-uniform because all of the mix was not in motion.

By changing to a rotary mixer of the type shown in Figure 1, the entire batch of binders and sand is kept in constant motion. The entire load in the mixer is tumbled, turned, cut, and folded as the machine rotates. The result is rapid, accurate blending, lower mixing costs, increased production, fewer rejects due to mold cracking, and better dimensional control.

*VICE PRESIDENT
ARWOOD PRECISION CASTING CORP.

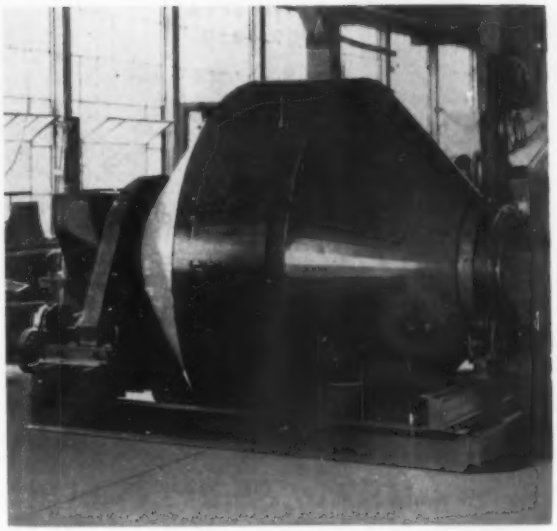

FIGURE 1. A Munson Rotary Batch Mixer used for mixing and blending binder chemicals and sand for investment casting molds.

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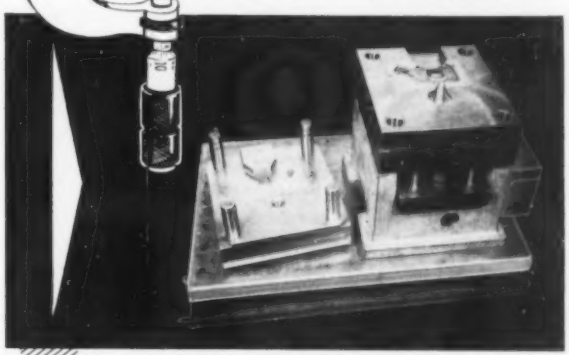
PRECISION DIE CASTING DIES FOR ALL MACHINES



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You can benefit by Milwaukee's 50 Years' Service to Industry

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Since 1909, it has been the privilege of the Milwaukee Die Casting Company to work with manufacturers of a wide variety of products . . . from mechanical pencils to airplanes . . . in applying the die casting process to their problems of parts design and production. In those 50 years, Milwaukee has pioneered many of the developments which have since become standard practice.

If you wish to benefit by our 50 years of continuous service to industry coupled with the advantages of our modern die casting plant, we invite your inquiries.

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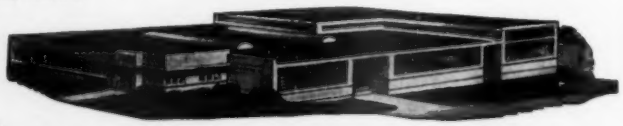

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Established 1909

A9-8701

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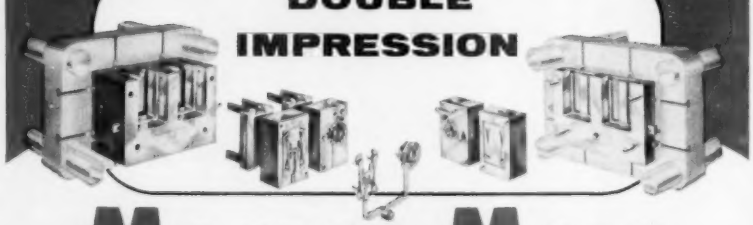

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for aluminum and zinc die casting

It's here now — vertical position, double-impression molding. With Richards Master-Mold, either or both molds can be changed *in minutes*, from the top, with eye bolts and regular hoisting equipment. Eliminates manual handling of hot molds, saves time — speeds production.

Write for full particulars and prices on Richards Vertical Position Master-Molds and cavity blocks.

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SMELTING INDUSTRY

continued from page 55

ware. In the main, the automobile manufacturers, preferring multiple sources of supply, will continue to depend on outside sources for many of these castings, they predict.

The smelters also expect to supply a substantial amount of the aluminum casting alloys used for wheels, bumpers, grilles, and other aluminum components which will be going into the automobiles of the future.

SCRAP ALUMINUM

As far as the supply of scrap aluminum is concerned, the smelters feel the continuing growth in the supply will be sufficient for their expanding markets, providing that the supply is judiciously handled and protected against drain-off through export.

As more aluminum goes into fabrication, supplies of new or generated scrap must continue to rise, the smelters say. Also on the rise is the supply of old scrap as post-war-manufactured products reach

Eliminate pinhole porosity and oxide inclusions in aluminum castings with

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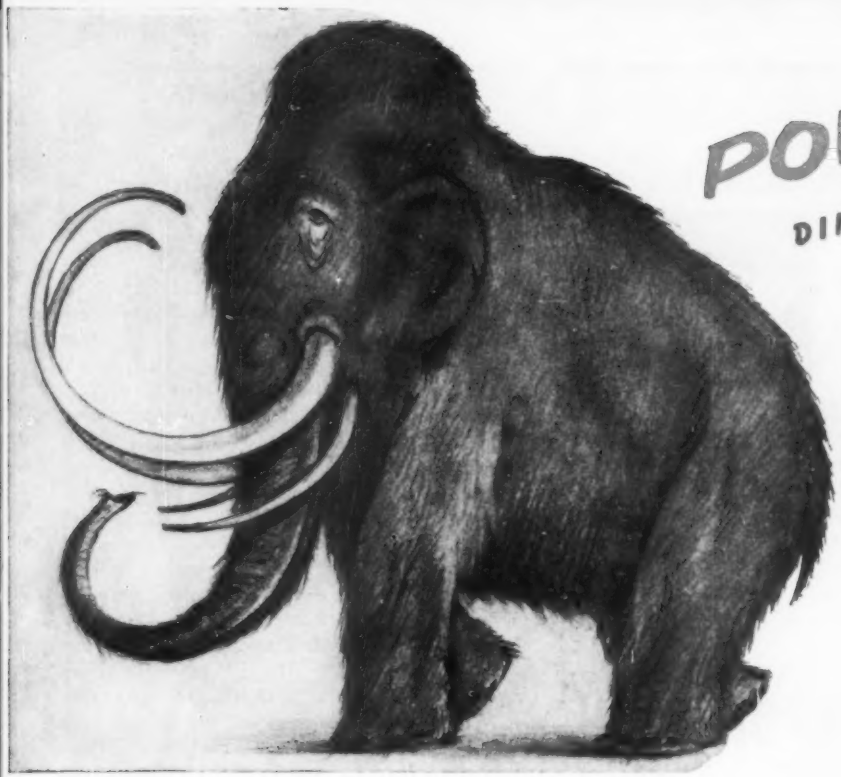

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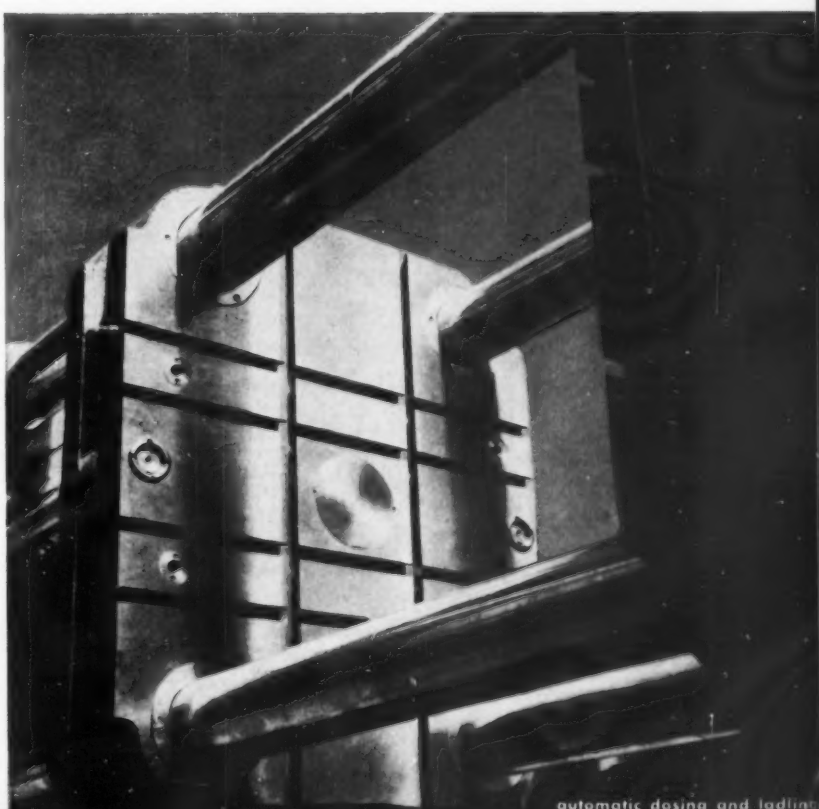

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SMELTING INDUSTRY

continued

the obsolescent stage and find their way into the scrap market.

This year, total aluminum scrap supplies, including imports, are expected to be in the neighborhood of 900 million pounds, 700 million of it in new scrap. A year ago, the total scrap supply amounted to about 800 million pounds, and in 1950 only 500 million pounds were available.

Looking ahead, the smelters expect the supply of new scrap to increase to somewhere in the neighborhood of 1 billion pounds by 1965. The rate of increase in obsolescent scrap will also increase at a modest rate, they say, until about 1964. Then, products manufactured in the 1950's with large amounts of aluminum components will begin to reach the scrap market. By that time, they expect old scrap to total between 400 and 500 million pounds, with a continuing and rapid increase in the supply of this type of scrap in the years beyond.

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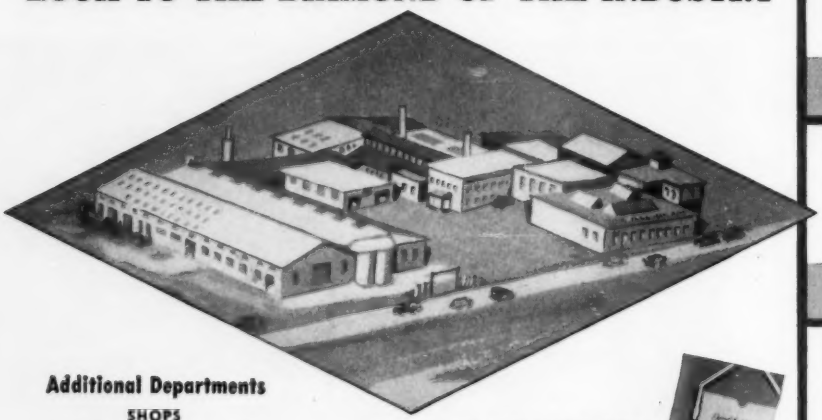
LOOK TO THE DIAMOND OF THE INDUSTRY



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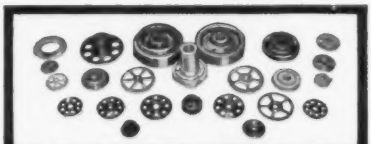

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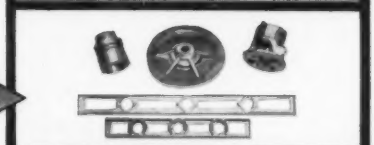

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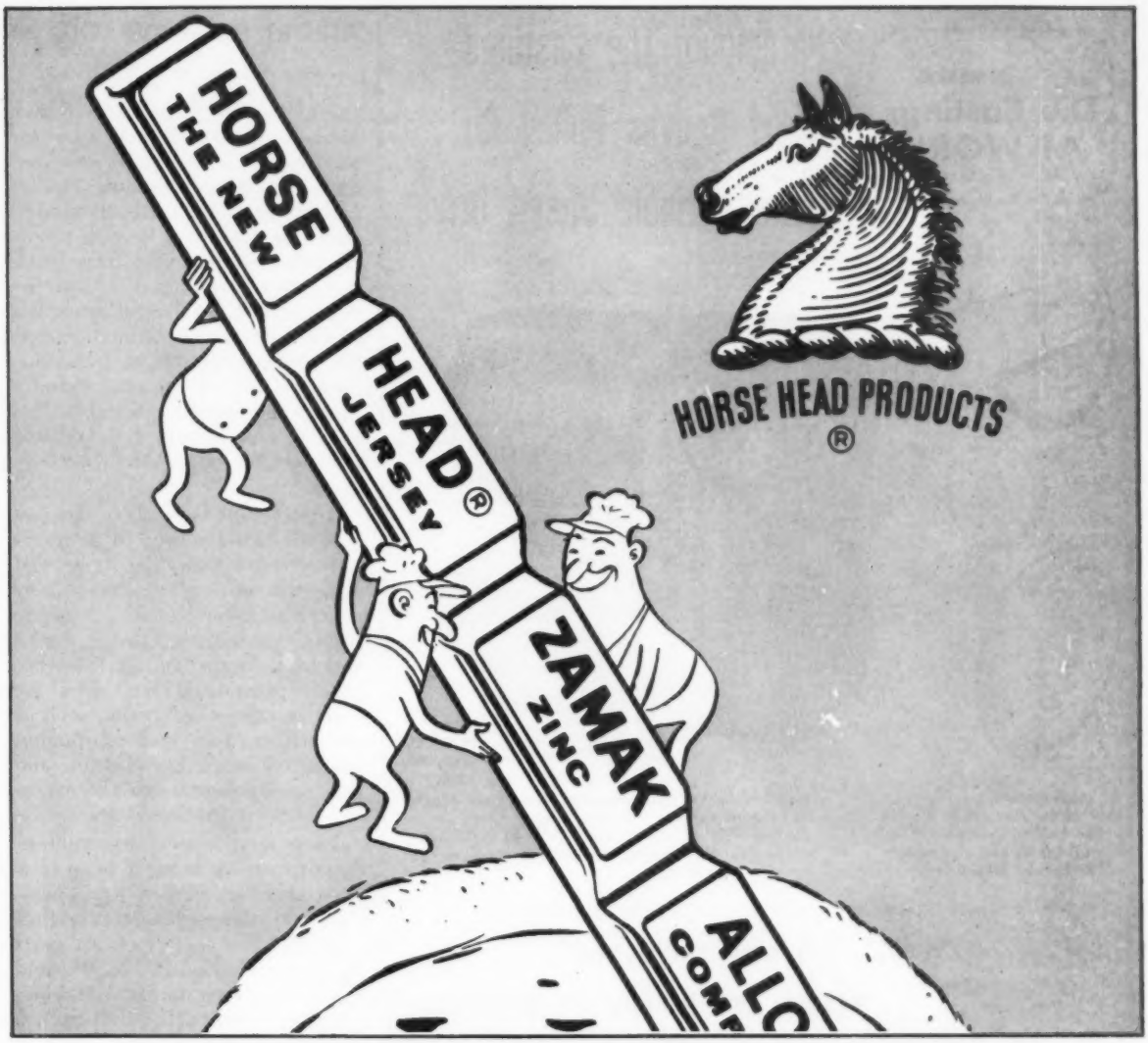

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IT'S MADE to more rigid composition limits than those established by A.S.T.M. for zinc die casting alloy. Its unexcelled, 25-year record of uniform composition is your guarantee of the most dependable zinc die casting alloy on the market.

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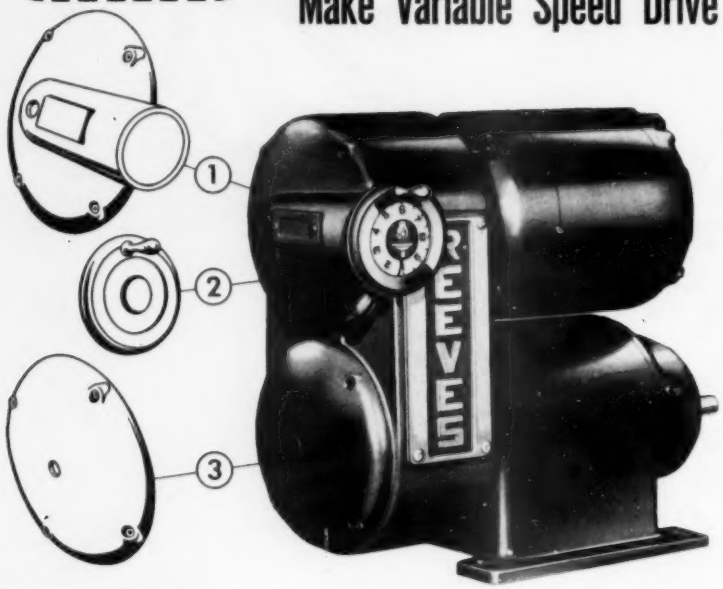
Paramount Die Castings AT WORK
No. 1 of a Series.

Paramount Die Castings Helps Reeves Pulley Co. Make Variable Speed Drive



The three castings above are supplied by Paramount to Reeves Pulley Company for the end shields and dial wheel on the Reeves Motodrive.

Size 100 Reeves fractional hp. Vari-Speed Motodrive with infinite variable output speed from 2.86 to 4660 rpm. Size 100 is one of a full line of Reeves Motodrives for speed control on ¼ hp. through 40 hp.

Paramount can help solve your design and production problems.

If there's a die casting in your product, it will pay you to investigate the complete die casting service available at Paramount Die Castings Co. Paramount's designers, sales engineers, plus modern tooling and production facilities offer you an ideal source for all your die casting requirements.

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Paramount has extensive facilities for the production of die castings from all three . . . Zinc, Aluminum and Magnesium. And, Paramount is set up to handle the whole job, from blue print to machined, finished or plated part . . . offering an integrated time and cost-saving service to manufacturers in a wide variety of industries.

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two in St. Joseph, Michigan,
one in Seymour, Indiana

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REPORT FROM DETROIT

continued from page 52

de-emphasizing decorative trim, zinc die castings showed a per car increase rather than the expected decrease. Data from auto makers and independent die casters showed that this was true because many traditionally die cast zinc parts were being produced as heavier units, making up the difference lost in the trim area. Zinc men observe that, when the styling pendulum swings back — as auto industry history indicates it invariably does — more zinc than ever should find its way into automotive applications.

A detailed breakdown for all zinc die castings used in representative 1959 automobiles shows that some 12% are employed for purely decorative applications, such as emblems, medallions, name plates, and trim. Approximately 18% serve purely functional uses under the hood or otherwise unseen, such as carburetors, fuel and oil pumps, filters, oil seals, transmission and brake components, etc. The majority — 70% are functional-decorative.

These serve a necessary, utilitarian purpose, but being in open view must also be designed for appearance and esthetic detail, as well as strength. This includes such parts as door and window handles and cranks, rear view mirror assemblies, headlight and taillight housings and doors, instrument cluster panels, and window frames.

The independent die caster explains that most automotive applications served by zinc die castings could not be made as efficiently or economically by any other material or method of fabrication. Zinc die castings are used because of the metal's intrinsic properties and specific requirements of the auto manufacturer. For these applications, zinc has no competition, say zinc men — its properties are unmatched.

Pointing to the traditional advantages of zinc die castings, coupled with the enhanced corrosion performance achieved with improved plating approaches, zinc suppliers to the auto industry are confident of continued strength and steady growth in this important zinc market.

THESE SINTEEL® POWDERED METAL PARTS FOR 1959 AUTOMOBILES

save production time lower costs and improve product performance

This two unit assembly, produced by the American Sinteel Corporation, is the control mechanism used on the reclining seats of a 1959 automobile. It is an excellent example of how a multitude of desirable features can be incorporated into a powdered metal part.

This pump rotor with its seven "slippers" is employed in the automatic transmission of an automobile. Because of its complex design, it was a difficult and costly part to produce by conventional methods. American Sinteel engineers were able to solve the problems involved and now the part is being produced on a production basis at a low unit cost.

Low cost, high speed production, close tolerances and unusual design possibilities are among the many advantages of Sinteel powdered metal parts. There are literally thousands of applications, including such products as gears, cams, complex nuts and fasteners, special purpose filters and structural members from steel, iron, brass and copper alloys, where Sinteel powdered metal parts can improve the performance of products now being made by other, more expensive methods of manufacturing. Powdered metal parts are available with many special characteristics, including self-lubrication, controlled porosity for infiltration and good electrical and magnetic properties for pole pieces, armatures and cores. Whatever your product requirements are, American Sinteel Corporation can produce precision parts to your specifications at substantial savings.

For more information on Sinteel ferrous and non-ferrous powdered metal products, send for your free copy of Engineering Bulletin #3020. It contains valuable information on Sinteel alloys and designing for Sinteel powdered metal products. ▶

SINTEEL®

AMERICAN SINTEEL CORPORATION

39 SAW MILL RIVER ROAD, YONKERS, NEW YORK

A SUBSIDIARY OF MUELLER BRASS CO.

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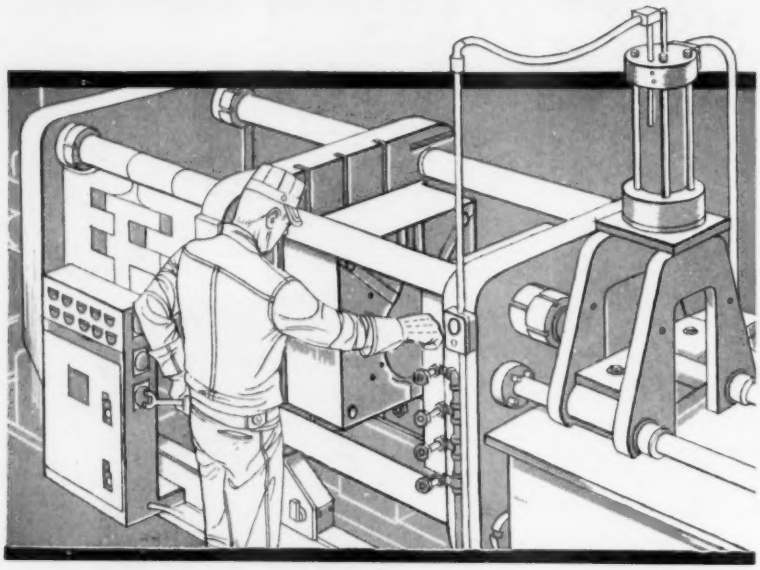
If you can do it with light alloys . . . you can do it BETTER with PMD dies!



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PERMANENT MOLD DIES

PISTON CORES

Special Equipment

- Permanent Mold Operating Devices
- D.C. Casting Units
- Billet Molds
- Collars for Tubing
- Trim Dies

COMPLETE DESIGN AND ENGINEERING SERVICE AVAILABLE

Yes, if you produce light alloy castings, you can do it better with PMD dies! Longer service life, minimum starting problems, lower overall tooling costs — these are plus advantages you get from PMD!

One of America's largest independent producers of dies, molds, special machines and molding devices, Permanent Mold Die Company offers every facility to do the job right! Complete design-engineering service . . . skilled, experienced personnel . . . plus the specialized tools and equipment to meet every requirement.

PMD dies and molds are designed to perform to your specification! For the right solution to your tooling problems — call in a PMD specialist. Write or phone today!

PERMANENT MOLD DIE COMPANY, INC.

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FINISHING TECHNIQUES

continued from page 56

ACCELERATED CORROSION TESTING

One of the great obstacles in developing newer and better plated zinc die castings has always been testing. If tested in the environment for which the part is intended, several years would have to be spent in exposure tests alone. The standard salt spray test could not be correlated with service life. Recently, however, two new tests have been developed which seem to give excellent correlation with exposures in industrial atmospheres.

Accelerated Acetic Acid Salt Spray. This is a modification of the standard salt spray test. Acetic acid and some highly corrosive material, such as cupric chloride, are added to the salt solution. The test temperature is 122°F. and runs from 8 to 30 hours. The results from this test are being used by some companies to evaluate chromium plate on zinc die castings. So far, the correlation seems good.

Corrodekote. This test consists of applying a paste of kaolin, ammonium chloride, ferric chloride, and copper nitrate to the chromium plate. The specimen is then held in a humidity cabinet for 20 hours at 98% relative humidity.

Complete details of both of these tests are reported in "Accelerated Corrosion Tests for the Performance of Plated Coatings," *Plating*, 44,763, (1957).

ANODIZING

Successful anodizing of aluminum die castings apparently depends on developing a die casting alloy which is substantially free of silicon. One such alloy developed in England was reported in PRECISION METAL MOLDING, March, 1959, page 32. To date, there are no known domestic applications of this alloy.

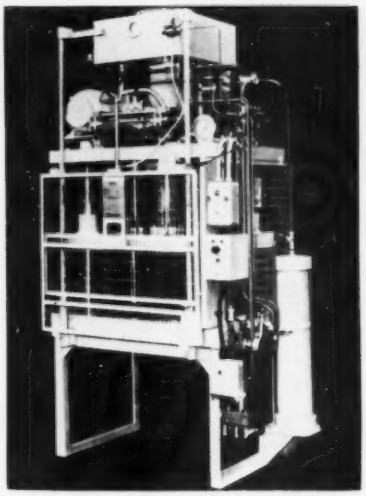
Some major successes have been reported in die casting silicon-free aluminum, using vacuum equipped machines.

Apparently the sluggishness of these alloys is adequately overcome through the use of vacuum. Samples, gold anodized, have good color but questionable surface.

NEW PRODUCTS

continued from page 26

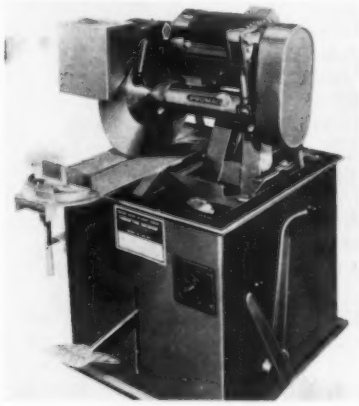
TRIM PRESS



B.I.P. ENGINEERING, LTD. — An entirely self contained press suitable for trimming die castings. The press features fast approach and fast advance at full load through the work. Free cycling time is 3 seconds. Maximum pressure 34 tons with 11 or 22 tons maximum easily set through an intensifier. Table, 30″ x 31″ with 26″ daylight.

Circle No. 238 on Reader Service Card

CUT-OFF SAW



PRODUCTION MACHINERY, INC. — A new cut-off saw that can be used in the shop or foundry. The blade is a special alloy which is said to cut so fast that the work is never heated. Carbon, alloy and stainless steels can be cut without coolant. The finished cut is practically burr-free.

Circle No. 239 on Reader Service Card

20-INCH BAND SAW

DELTA POWER TOOL DIV., ROCKWELL MFG. CO. — A variable-speed drive, 50 to 4500 fpm, band saw has been introduced. The saw, ideal for cutting everything from stainless steel to aluminum, is designed for heavy-duty foundry work and other industrial uses.

Circle No. 242 on Reader Service Card

FINISHING BUFF

SCHLEGEL MFG. CO.—The Ray-Buff goblet metal finishing buff features high quality performance at an economy price. The buff is made of springy, dense wool fibers, uses liquid or solid polishing compounds, and is said to be ideal for automatic polishing equipment.

Circle No. 243 on Reader Service Card

SAFE PUNCH PRESS

KENCO MFG. CO. — Electro-Safe punch presses that feature complete operator safety have been developed. The presses are available in 5, 8, 12, 15, 18, 21, and 26 tons.

Circle No. 273 on Reader Service Card

continued on page 99

All Items in Stock for Immediate Shipment

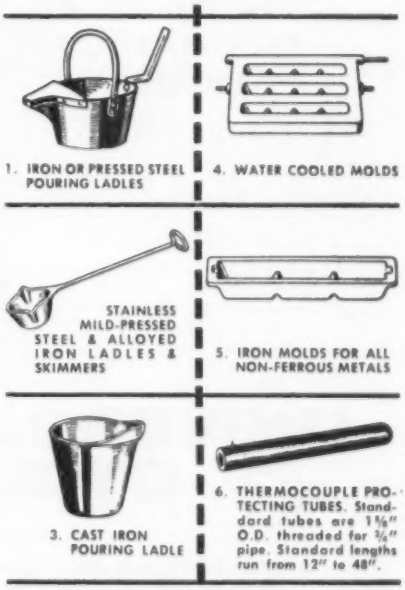
COMPLETE LINE OF MELTING EQUIPMENT FOR DIE CASTERS, NON-FERROUS FOUNDRIES, & SMELTERS

• Melting Kettles • Ingot Molds • Pallet Molds • Slag Buggies • Ladle Bowls • Thermocouple Protecting Tubes • Milles "Ferrisist" Ladle and Kettle Wash • Pouring Ladles • Pressed and stainless Steel Ladles and Skimmers • "Di-Alube" Lubricants for Die-Casters • Milles Fluxes for Zinc and Aluminum • Milles Portable Pumps.

Get Catalog No. M-1 for detailed information on our complete line of melting equipment.

NEW YORK REPRESENTATIVE—FRED W. HARMON
15 ARDMORE ROAD • SCARSDALE, NEW YORK
TELEPHONE 3-6669

LOS ANGELES REPRESENTATIVE
INDEPENDENT SUPPLY CO.
6463 CANNING STREET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STAINLESS MILD-PRESSED STEEL & ALLOYED IRON LADLES & SKIMMERS
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MILLES EQUIPMENT & SUPPLY COMPANY
MANUFACTURERS OF SPECIAL ALLOY HEAT RESISTANT IRON
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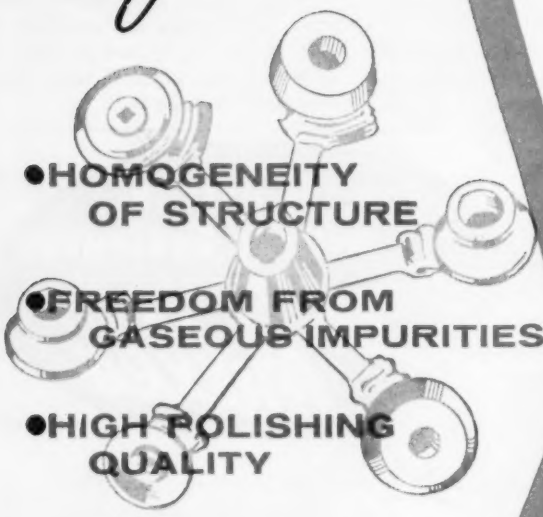
for...



- HOMOGENEITY OF STRUCTURE
- FREEDOM FROM GASEOUS IMPURITIES
- HIGH POLISHING QUALITY
- RESISTANCE TO THERMAL AND MECHANICAL FATIGUE

Vacuum Degassed

THERMOLD® AV

DIE CASTING DIE STEEL

Thermold AV—the superior die casting die steel, assures you of highest quality by the use of a modern melting technique—*vacuum degassing*. For the first time in the United States, Universal-Cyclops has produced large size ingots of vacuum degassed Thermold AV in standard production processing.

Thermold AV—the ultimate in die casting die steels features homogeneity of structure, freedom from gaseous impurities, higher polishing qualities, and resistance to thermal and mechanical fatigue.

Thermold AV—is hot worked on a 2,000 ton fast-acting press to assure improved center structures. In addition, Thermold AV is subject to quality controls which have set the standard for the industry: small batch furnace melting, close control of press forging and annealing, and 100% Reflectoscope testing.

Thermold AV is supplied in all sizes to meet your requirements. For complete information, call or write your nearest Universal-Cyclops sales office or warehouse today.

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STEEL CORPORATION
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For more information circle No. 87 on the Reader Service Card

NEW PRODUCTS

continued from page 97

BARREL FINISHING CHIP

MINNESOTA MINING & MFG. CO. — "Honite" brand Z-N Tumbling Shape, is a barrel finishing media designed for zinc die castings. It offers fast cutdown, produces a low micro-inch surface and protects workpieces against impingment.

Circle No. 240 on Reader Service Card

FLOW RATE INDICATOR

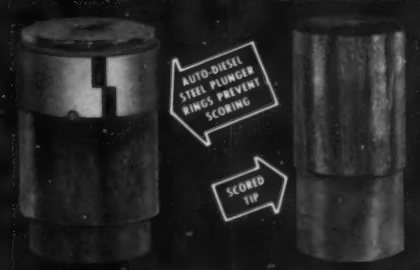
FISCHER & PORTER CO. — A transistorized, servo-driven flow rate indicator for magnetic flowmeters. Accuracy of the unit is ±2% of full scale; repeatability ±1%.

Circle No. 274 on Reader Service Card

continued on page 102

For more information circle No. 12 on the Reader Service Card

AUTO-DIESEL'S NEW TIP & RING PLUNGER COMBINATION



6 MONEY SAVING ADVANTAGES

1. Longer wear
2. Denser castings
3. Eliminates aluminum pick-up on sleeves
4. Reduces tip changing down-time
5. Eliminates buying or making new tips
6. You can salvage and use your old tips

Greater Efficiency

Solves problem of scored or worn tips—saving thousands of dollars per year for the die casting industry.

Beryllium copper and steel plunger rings on piston tips result in maximum service life.

Catalog on Request

Plus—Auto-Diesel now offers stainless steel liners for goosenecks—increasing present life 4 to 1—literature on request.

THE AUTO-DIESEL PISTON RING CO.
3141 Superior Avenue • Cleveland 14, Ohio

SELECT CENTURY FOR SPECIAL SHORT RUN DIE CASTINGS

DIE CENTURY CASTING CO.

MODERN EQUIPMENT TO MEET YOUR DIE CASTING NEEDS

SHORT RUNS

We specialize in small quantities for both zinc and aluminum Die Castings, ranging in size from a fraction of an ounce to several pounds.

UNIT DIES

Our system of Unit Dies may easily solve your problems on small production quantities due to lower tool costs.

Consult Us on Your Requirements

CENTURY DIE CASTING CO.
2629 W. FLETCHER ST., CHICAGO 18, ILL.
TELEPHONE: IRving 8-2629

For more information circle No. 19 on the Reader Service Card

Announcing . . .

DU-CERAMIC

A special new material for investment casting cores

Big news in the ceramic industry is the development of a brand new material, Du-Ceramic, for investment casting production. Du-Ceramic has been designed expressly for achieving accuracy in precision molds. Shapes can be produced to close dimensional tolerances.

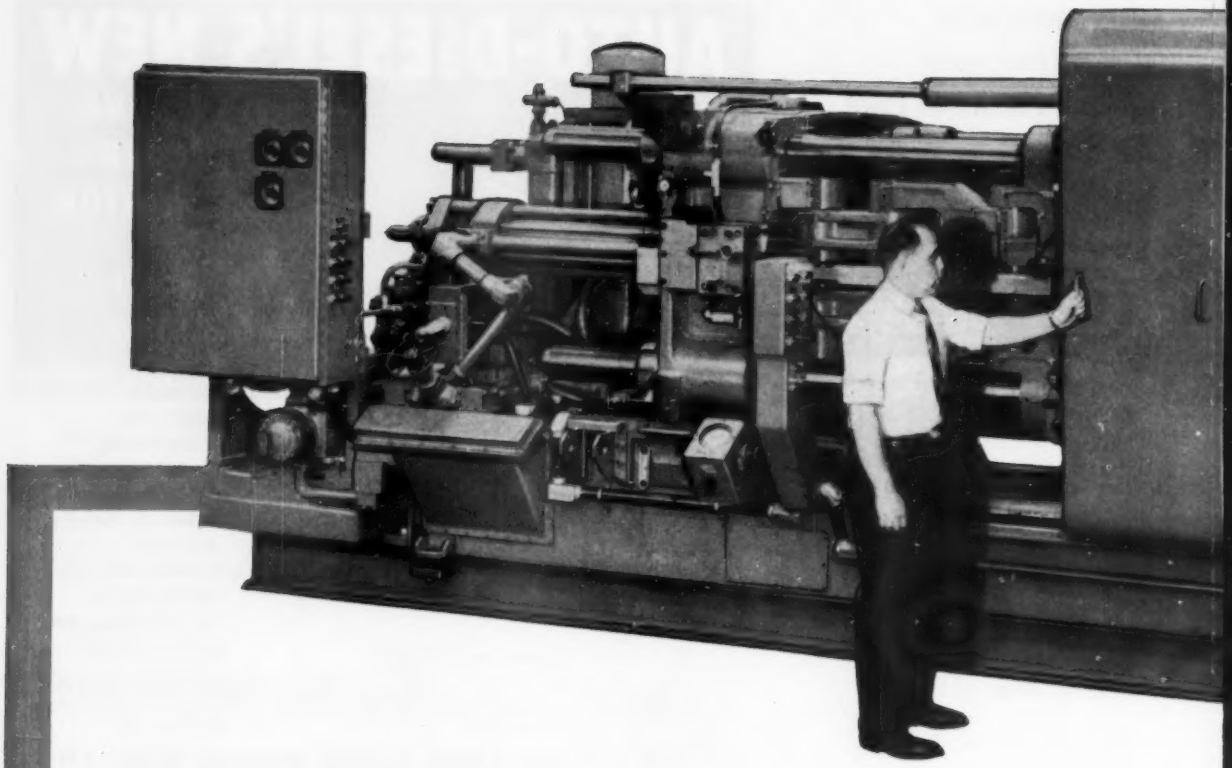
Cores made of Du-Ceramic require no drilling and other costly machining operations. The material is readily removed from the casting by leaching, using a concentrated sodium hydroxide solution.

DU-CO steatite and technical ceramics

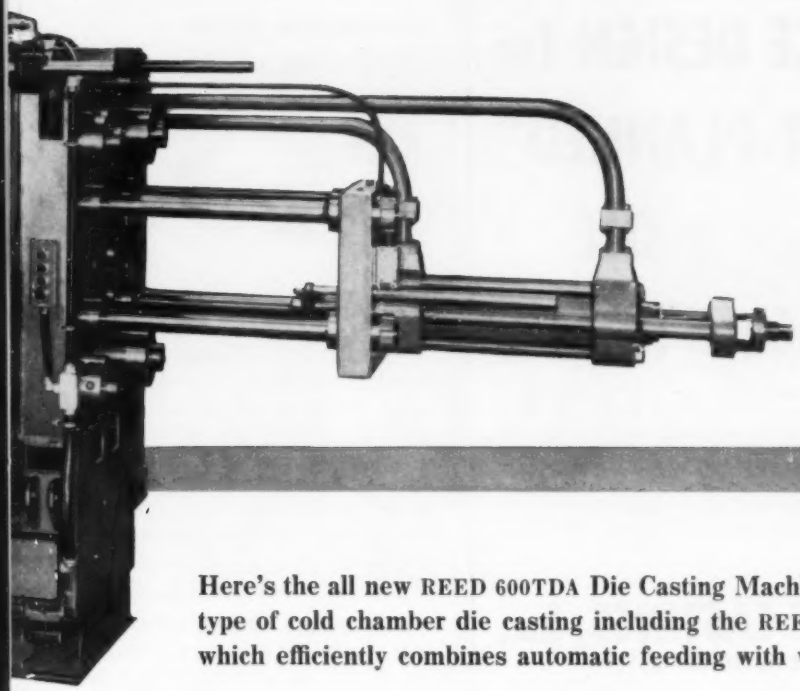
For samples of Du-Ceramic and additional information write us today.

DU-CO CERAMIC CO.
SAXONBURG, PENNSYLVANIA

For more information circle No. 32 on the Reader Service Card



600 TON REED-PRENTICE DIE CASTER



Here's the all new REED 600TDA Die Casting Machine — designed for any type of cold chamber die casting including the REED VACUFEED system, which efficiently combines automatic feeding with vacuum die casting.

This newest REED hydraulic die casting machine has been designed to produce the highest quality aluminum and magnesium castings possible. The REED 600TDA has 47" x 46½" die plates; 28½" x 28½" clearance between tie bars; a tie bar diameter of 5½"; and a strain gauge tested locking pressure of 600 tons. Here are a few of the outstanding design and operating features of the 600TDA that give you more dependable, efficient operation.

- Die stroke adjustable over 6" of initial stroke, providing an adjustable stroke of 12½" to 18½".
- Complete shot stroke cylinder is adjustable from 14" to 20" in order to accommodate different length sleeves.
- Shot cylinder is equipped with an adjustable slow start to allow complete venting of sleeve and runner systems.
- Adjustment of tie bars is accomplished by the use of one retained graduated tie bar nut.
- Tie bars may be pulled or moved forward by hydraulic power using a cam way lock device.

REED 600TDA IS ESPECIALLY DESIGNED FOR VACUFEED OPERATION BECAUSE:

- Shot end of machine is free and clear for furnace installation directly under shot cylinder.
- Electric and hydraulic circuits provide for any type operation, with open electrical positions on terminal block for use in operating companion or automated equipment.

Ask your REED Sales Engineer today for complete details about the new 600TDA and the use of VACUFEED in your aluminum die casting operations.

REED-PRENTICE

.....*division of*

EAST LONGMEADOW, MASSACHUSETTS

PACKAGE MACHINERY COMPANY

BRANCH OFFICES: NEW YORK • CHICAGO • BUFFALO • DAYTON • DEARBORN • KANSAS CITY • LOS ANGELES

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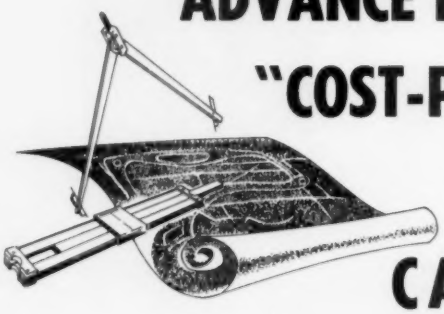
For more information circle No. 2 on the Reader Service Card

ADVANCE DESIGN for "COST-PLANNED" DIE CASTINGS



Advance Pressure Castings can take your product at any point in its development and carry it through to finished form. Every step of the way from blueprint to delivery of the finished product, your castings need the rich background of inventive engineering plus the custom-tooling and production facilities offered by Advance—and all at ONE SOURCE. Here, however simple or intricate the problem, you can depend on the finest skill and the greatest resourcefulness when fine zinc base or aluminum base alloy castings are involved. The best way to learn more about Advance Pressure Castings complete service is to discuss your casting problem with an Advance Development Engineer.

Send for literature and further details.

ADVANCE PRESSURE CASTINGS, Inc.

20-30 WYTHE AVE., BROOKLYN 11, N. Y.

"Sales Offices"

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DIE CASTING RESEARCH FOUNDATION PARTICIPANT

NEW PRODUCTS

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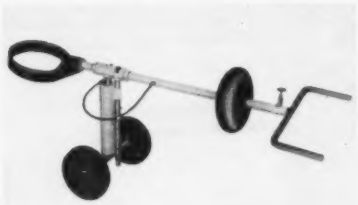
TOTES & POURS CRUCIBLES



MOREHOUSE MACHINE CO. — A hand truck that will convey and pour crucibles of molten metal. Called Unipour, the unit can be adapted to handle crucibles ranging in size from #40 to #100. It is raised and lowered pneumatically to adjust to varying pouring conditions.

Circle No. 244 on Reader Service Card

3 CHEMICAL PROCESSES

HANSON-VAN WINKLE-MUNNING CO. — has announced three new chemical processes: Alcond DX-100, for desmutting aluminum that has been etched in a caustic

continued on page 104

Serving the Die Casting Industry

SINCE 1944...

with . . . a complete line of interchangeable replacement parts for the injection end of aluminum and zinc die casting machines

THESE REX-BUCKEYE ENGINEERED PRODUCTS . . .

- Goosenecks
- Nose Inserts
- Plungers
- Piston Rings
- Plunger Couplings
- Nozzles
- Machine & Breakdown Pots
- Shot Sleeves
- Plunger Tips
- Plunger Rods

Complete rework service on goosenecks, plungers, shot sleeves and plunger tips.

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For All Types & Sizes of Die Casting Machines

Rex-Buckeye Co.

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2109 W. 41st ST., CLEVELAND 13, OHIO

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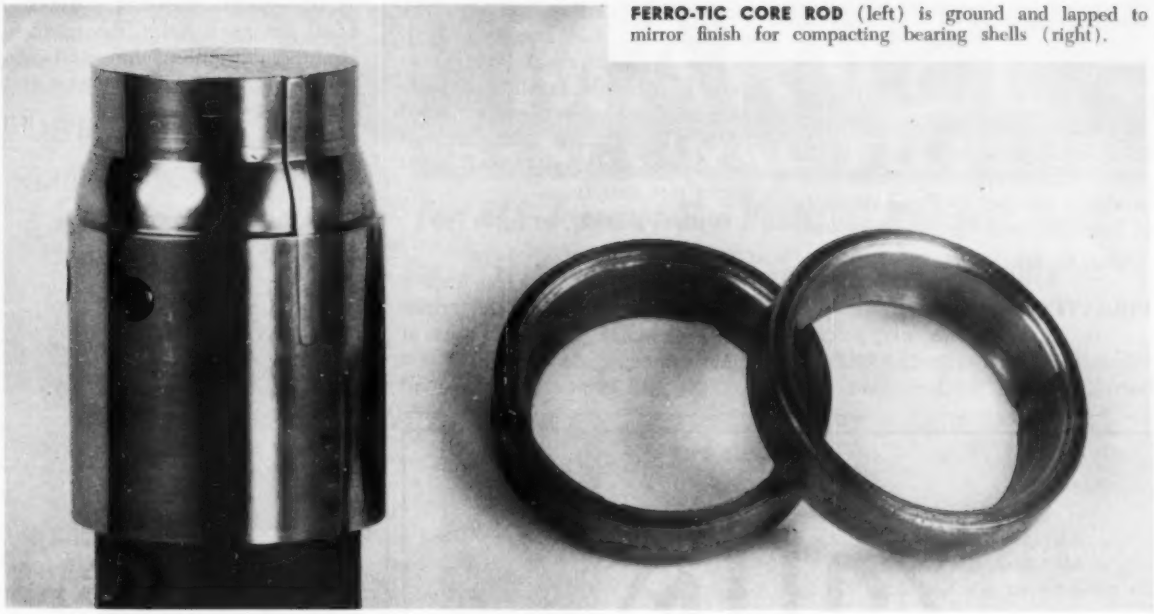


FERRO-TIC CORE ROD (left) is ground and lapped to mirror finish for compacting bearing shells (right).

You can cut sintering production costs with . . .

Machinable Carbide Compacting Tools

"HIGH ABRASIVE ACTION of powdered iron on our compacting tools has always been a problem, and it is especially critical when close tolerances must be held."

That's how Andre Blumenthaul, president of Norwalk Powdered Metals, Inc., Norwalk, Conn., summed up difficulties when high-carbon, high-chromium steel tools were used to press powdered iron spherical bearing shells.

In this particular application, it was extremely important that the internal spherical surface be kept true to form. The repeated abrasion of the powder against the core rod resulted in a wear ring – which meant rejects – after only 20,000 pieces were pressed.

The only answer appeared to be a core rod made of carbide. However, quotations submitted by carbide specialty shops for a conventional carbide part were high enough to make these carbides economically unattractive.

A good look was then taken at the new steel-bonded, machinable Ferro-Tic carbides. After preliminary evaluation, Frank Leone, tool room foreman, decided that by fabricating the core rod from this new material he could produce this part for one-third the quotation price.

Machining a steel-bonded carbide blank into the required shape was done without a hitch. The contour on the diameter was rough turned, allowing about .005 in. for finish grinding on the working surfaces only. Transverse locating pin holes were drilled and relief slots were milled. A ⅝-in. diameter internal thread about ¾ in. long was machined in the base for attaching the core to the steel connecting rod. A slot ⅛ in. wide and 1 in. deep was machined across the face in one pass of a 4-in. diameter high-speed-steel slotting saw.

Extra precautions were taken during heat treatment to avoid surface decarburization. The part was placed in a slightly carburizing pack and then brought to the austenitizing temperature of 1750° F under a controlled atmosphere. Quenching was in a medium oil. The core was then stress relieved at 375° F for 15 minutes. Hardness obtained was 71 Rc.

Finishing the working surfaces was done by first form grinding the required contour and then lapping to a mirror polish. Lapping involved first roughing with boron carbide and then finishing with diamond paste.

The new type core rod was put into the production line and ran over 250,000 pieces before replacement was necessary – a 12-time increase in production over the tool steel core rod.

These results, although outstanding at the time, have now become commonplace. Many compacting die sets have since been fabricated for a wide variety of powdered metal applications.

NEW PRODUCTS

continued from page 102

etchant and for deoxidizing; Chem-Rite A-22, an inexpensive chromate surface conversion coating treatment; Zincalume, a process that produces distinct brilliant deposits in both still and barrel equipment.

Circle No. 247 on Reader Service Card

VIBRATING BARREL

B. W. ELLIOT MFG. CO., INC. — Vibraslide 5 is a vibrating-rotating barrel finishing machine that features a 5 cubic foot capacity. The machine combines mechanical vibration with normal rotation to make possible the finishing of parts with inside diameters and recessed areas. The machine operates at 3 H.P. Speed of the vibrator is 2,300 cycles per minute.

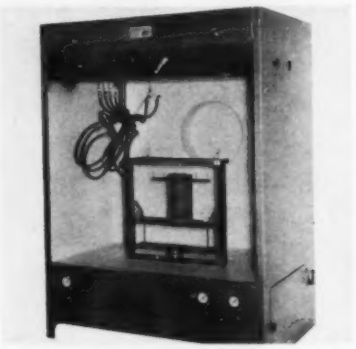
Circle No. 253 on Reader Service Card

GRINDER

THE ASCHOMBE CO. — The Airotor is an air driven cutting and grinding instrument that operates at spindle speeds in excess of 300,000 rpm. It will grind holes as small as .025" to tolerances of ±0.0001". Ideal for small holes, die cavities, etc., the unit will machine carbides, and hard metals with diamond and carbide tools.

Circle No. 249 on Reader Service Card

SPRAY PAINTING MACHINE



CONFORMING MATRIX CORP. — An automatic spray machine which paints one, two or three surfaces of generally oval or rectangular shaped pieces of varying length, where fine mask definition and paint demarcation are imperative.

Circle No. 248 on Reader Service Card

IDENTIFIES ALLOYS & PROPERTIES

METROL INC. — Heatcheck, a portable transistorized conductivity-permeability meter which rapidly sorts mixed lots of metal parts. The instrument will also test ferrous and non-ferrous metal parts for heat treatment condition, relative hardness and strength, chemical purity, and decarburization.

Circle No. 245 on Reader Service Card

VACUUM COATER

NRC EQUIPMENT CORP. — Model 3142 is a small production coater for short run and small lot vacuum metallizing operations. The unit features a horizontal 24" dia. x 30"

BDC

THE ACCEPTED STANDARD IN THE MIDWEST

FOR QUALITY, SERVICE AND COST

for

Experience. *Our expert engineers, designers and production men know how to save you money while turning out top quality die castings.*

Modern Facilities. *Modern tool room and die casting equipment are at your service when you buy from Badger.*

Service. *Speed, dependability and cooperation are keynotes in our customer relationships.*

Engineering Help. *The advice and assistance of our engineers can save you time and dollars in designing your castings.*

Reasonable Prices. *You'll find Badger die castings fairly priced.*

Badger Die Casting Corporation

201 W. OKLAHOMA AVE., MILWAUKEE 7, WISCONSIN

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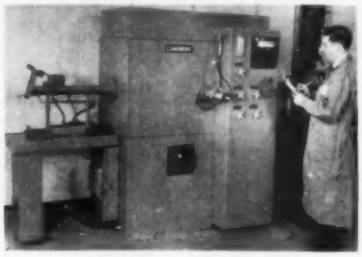
long coating chamber mounted on a cabinet containing the electrical system. Cycle times are very short.

Circle No. 250 on Reader Service Card

GRAPHITE TUBE FURNACE



LINDBERG ENGINEERING CO. — A graphite tube furnace has been developed that operates in the temperature range of 1600 to 5000° F. Applications include: sintering of powder metals; high temperature investigations of firing of ceramic bodies.

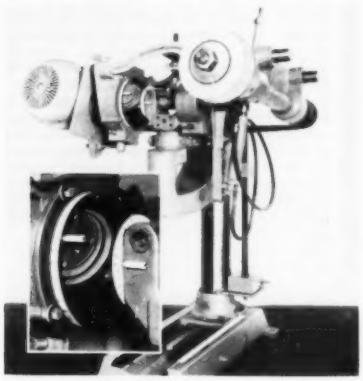
Circle No. 251 on Reader Service Card

ADJUSTABLE TAPPING HEADS

ETTCO TOOL & MACHINE CO.—Model 1100 "Knuckle-Head" is a universal ball joint adjustable spindle drilling and tapping head that can be operated with from 2 to 11 spindles. The unit has a capacity up to 5/16" in steel and can be set to any hole pattern in a working area of 6" x 12".

Circle 252 on Reader Service Card

BUFFING HEAD POSITIONER



MURRAY-WAY CORP. — Position indicators have been developed that take the guesswork out of polishing and buffing head positioning. Numbered dials make it easy to check head positions. Any variation or change in head position is quickly noted. Once the correct head positions are found and recorded, heads may be changed and reset.

Circle No. 241 on Reader Service Card

continued on next page

MARVEL
SYNCLINAL FILTERS

For ALL Types of Fire Resistant Hydraulic Fluids — Hydraulic Oils — Coolants — Lubricants

SUMP TYPE FILTERS

CAPACITIES: 10-20-30-50 and 75 G.P.M.

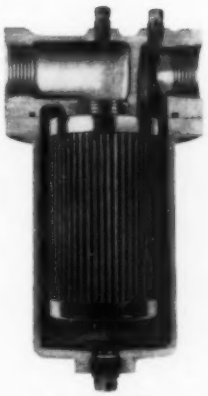
PIPE SIZES: 1"-1¼"-1½"-2" and 2½".

CONNECTIONS: Coupling — "O" Ring — Male Nipple.

FILTERING MEDIA: Monel wire cloth available in mesh sizes of 30-40-50-60-80-100-150 and 200 to meet your degree of filtration requirement.

BY-PASS VALVE: Available with or without.

EASY TO CLEAN.



LINE TYPE FILTERS

CAPACITIES: 10-20-30-50 and 75 G.P.M.

PIPE SIZES: 1"-1¼"-1½"-2" and 2½".

FILTERING MEDIA: Monel wire cloth available in mesh sizes of 30-40-50-60-80-100-150 and 200 to meet your degree of filtration requirement.

BY-PASS VALVE: Available with or without.

OPERATING PRESSURE: Up to 250 p.s.i.

OPERATING TEMPERATURES: Up to 300° F.

EASY TO CLEAN.

FOR DEPENDABLE PROTECTION on all Hydraulic and other low pressure circulating systems

MARVEL FILTERS are designed to give more ACTIVE filtering area—MORE dependable protection—MORE productive operation before filter cleaning is necessary. *They meet J.I.C. Standards.*

OVER 900 Original Equipment Manufacturers install Marvel Filters as Standard Equipment.

IMMEDIATE DELIVERY

For further information on a specific type or size filter — Write — wire or phone

MARVEL ENGINEERING COMPANY
7227 N. HAMLIN AVE.,
CHICAGO 45, ILLINOIS
Phone: JUNIPER 8-6023

Please send me information on Marvel Synclinal Filters, as indicated: PMM-9

☐ SUMP TYPE FILTERS ☐ LINE TYPE FILTERS

Name.....

Company.....

Address.....

City..... State.....

Precise CASTINGS, INC.

A NEW NAME in DIE CASTING

BUILT ON MORE THAN 50 Years Experience

John P. Sikorski, Pres.
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Precise Castings, Inc.

321 South Third Street
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Write for complete details

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NEW PRODUCTS

continued from page 105

IMPACT TESTER

TESTING MACHINES, INC. — This power operated, remote controlled testing machine meets ASTM Method E-23 requirements and performs Izod, Charpy, and Tension-Impact Tests for metals. The unit features an automatic electric safety clutch brake, which stops the pendulum after it has made one complete swing, and a motorized pendulum return.

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Improve the physical properties of your aluminum castings with

Foseco® NUCLEANT

grain-refining compounds

This bulletin tells you how. Send for your free copy today.

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P. O. Box 8720, Cleveland 35, Ohio

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General Controls Corp. reports on

PLUNGER LUBE LITE SPECIAL

A DIE CASTING LUBRICANT FOR Automatic Lubricating Systems

Wilf Botfield
Superintendent
Die Casting Div.
General
Controls Corp.
Glendale,
Calif.

"We, in the Die Casting Division of General Controls Corporation, had the problem of finding a lubricant that would flow at room temperature for the automatic systems of lubrication on our machines. A new lubricant, **PLUNGER LUBE LITE SPECIAL**, was put into service at our plant on a trial basis. After 2 months of operation, we found that repair costs and down time on metal injection cylinders, plunger tips and sleeves were reduced by as much as 40%.

"**PLUNGER LUBE LITE SPECIAL** is a dark colored adhesive material viscous that flows at room temperature. It carries a percentage of suspended micro-fine metallic combinations, is a very formidable opponent to wear, and has the unusual quality of remaining adhesive and not thinning out when applied to the hot tip. We found that this lubricant will remain WET and yet will not allow the flow of fluid to by-pass into the casting runners or on into the castings, causing gaseous porosity. With these qualities we didn't have to worry about the higher pressures for the pumps for the automatic systems. This eliminated our pump troubles and made it a simple matter to meter the desired amount for each shot."

The Die Casting "ID" Corporation is well aware of the need in reducing the costs of honing, grinding and renitriding cylinders. We trust that this new lubricant, now proven successfully in the field, will be of service to you.

For more information write to

The DIE CASTING "ID" Corp.
4902 Ledge Ave. • N. Hollywood, Calif.
Telephone **CH 5-4700**

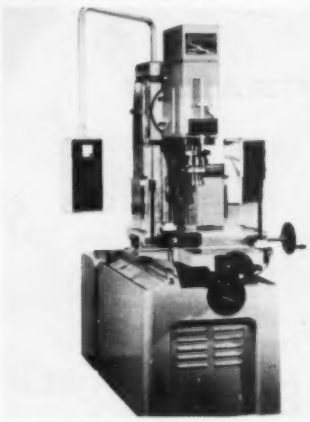
Circle No. 26 on the Reader Service Card

TEMPERATURE MONITOR, CONTROL

MASON INSTRUMENT CO. — A non-contacting temperature monitor and control has been developed in the low temperature range of 250-1000° F. It features an optical system capable of detecting small or moving targets. The unit is said to be ideal for extrusion, soft soldering or low temperature brazing.

Circle No. 246 on Reader Service Card

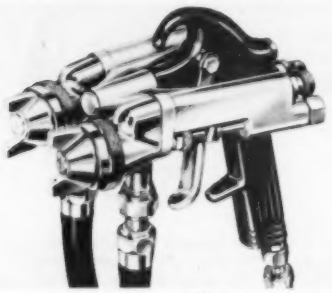
SPARK ERODERS MACHINE DIFFICULT METALS



CARL HIRSCHMANN CO., INC. — The Agietron line of Spark Erosion machines can machine the most difficult metals to meet formerly impractical shapes and slot designs. Dies can be accurately machined out of titanium, molybdenum, tungsten carbide and stellite. Eroders from ½ KW to 12 KW are available.

Circle No. 267 on Reader Service Card

TWO-HEADED SPRAY GUN



BINKS MFG. CO. — This two-headed spray gun can be used for two-component finishing systems where perfect mixing is not required, or where pre-mixing is impractical. Three hoses, two for material and one for air, are used. Equal or different pressures can be used.

Circle No. 257 on Reader Service Card

continued on next page

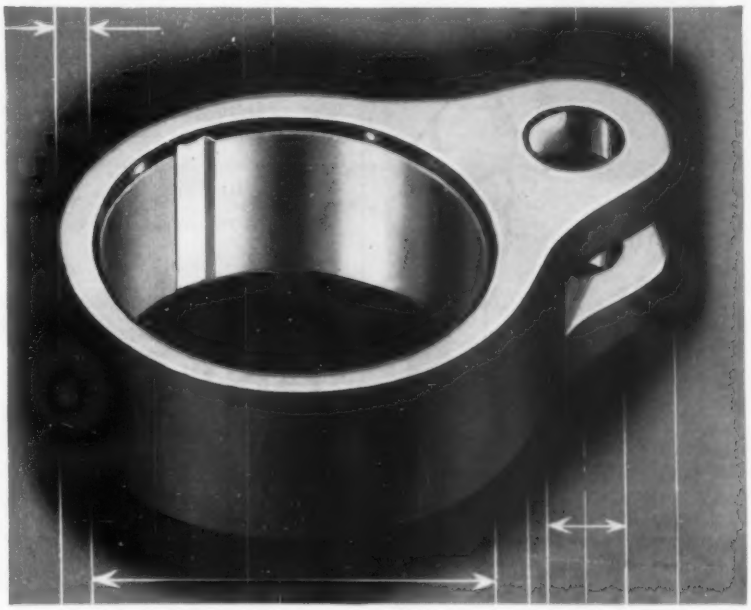
exceptionally close limits...

The photograph shows the connecting rod of an unusual hydraulic pump built by a company whose name is known everywhere.

The finish in the bore of both the large hole and the small hole must be held to very fine profilometer reading.

In addition, the axes of these two holes must be parallel to each other within exceptionally close limits. Naturally, the user of a cast bronze part such as this turns to Bunting in order to assure strictest adherence to his print and specifications.

For the unusual, as well as the usual, in bearings, bushings, bars, or special parts of cast bronze, sintered bronze, or Alcoa aluminum, try Bunting first.



BUNTING SALES ENGINEERS in the field and a fully staffed Product Engineering Department are at your command without cost or obligation for research or aiding in specification of bearings or parts made of cast bronze or sintered metals for special or unusual applications.

...ask or write for your copy of...

Bunting's "Engineering Handbook on Powder Metallurgy" and Catalog No. 58 listing 2227 sizes of completely finished cast bronze and sintered oil-filled bronze bearings available from stock.

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Branches in Principal Cities

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THE PIERCE-WALLER

AIR-LUBE SYSTEM

CUTS COSTS for DIE-CASTERS

• CLEANS
• LUBRICATES

Remove loose flash and clean the mold with a powerful, clean air blast — then lubricate all mold surfaces evenly, *using the same gun* —with a flick of the thumb! Adjustment *at the gun* for full range from zero to a heavy mist, spraying, fogging, or vaporizing the lubricant. Speeds up mold operation and reduces casting rejects. Makes every machine cycle count.

USED IN LARGE AND SMALL SHOPS EVERYWHERE!

WRITE FOR FREE FOLDER

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P.O. Box 2121A • DAYTON 29, OHIO

Plant: RAJAK MFG. CO.
Specialists in polyester impregnation of metals
245 N. Fourth St. • Tipp City, Ohio

Circle No. 71 on the Reader Service Card

NEW PRODUCTS

continued from page 107

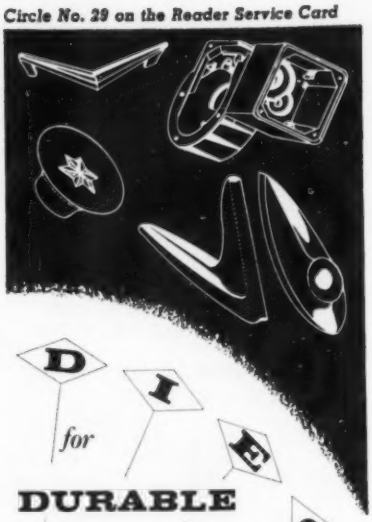
SCRATCH INVESTIGATION

ENGIS EQUIPMENT CO. — The Hilger & Watts Scratch Investigation Microscope can measure scratches and pits on the external surface of extruded metals with diameters ranging from .125" to 3". It can be used on flat or curved surfaces. Range of measurement is from .0005" to .012".

Circle No. 270 on Reader Service Card

continued on page 110

Circle No. 29 on the Reader Service Card



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Send for your copy of "Zinc Die Castings Savings"
Prompt quotations given on blueprints or samples

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3rd in a series of POWDERED METAL PARTS applications by REESE

COST AND SERVICE STORY

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From John B. Spiggle, Purch. Agent for the Otto Bernz Co., Inc.: "Our present brass powdered metal knob was evolved from a smaller knob that was re-designed from a screw machine part to reduce cost. When we required a larger but similar knob on another product, we immediately thought of powdered metal. Reese received the order for this new part because their price and delivery were better than others who had quoted. We have continued to do business with Reese because their prices have been in line and their service and quality better than our other sources for powdered metal parts."

***FREE BROCHURE** "How to Cut Precision Parts Cost with the Remet Powdered Metal Process" shows how the Reese Corp. can help you. Send for your copy today.*

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Gears • Pinions • Cams • Ratchets
Oilless Bearings • Bushings • Machine and Structural Parts in
COPPER • BRASS • IRON • ALLOY STEEL • NICKEL SILVER • COPPER INFILTRATED IRON

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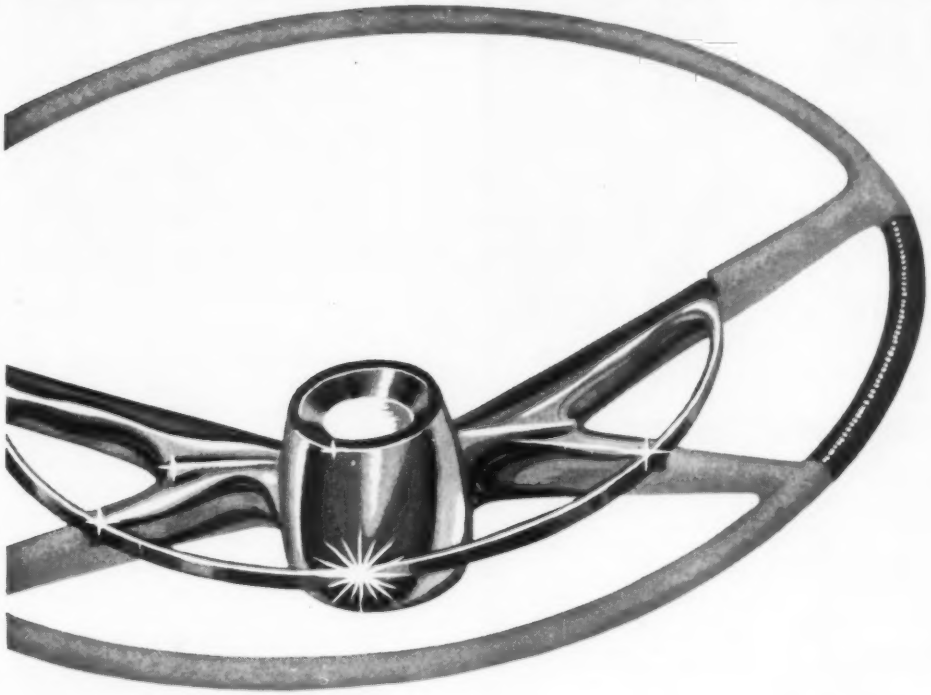
FOR BEAUTY AND UTILITY



specify TADANAC zinc

The gleaming horn ring of a modern automobile is both functional and ornamental. It is also one of the many parts of today's cars made from die-cast zinc. For the very best in die-casting zincs, specify TADANAC BRAND — or alloys made from it.

For information and assistance regarding zinc die-casting, contact our Technical Service Staff. Your inquiries will be given immediate attention.

With TADANAC BRAND Zinc you get electrolytically refined zinc of consistent high quality, low in impurities and always in good supply with prompt delivery assured.

THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA LIMITED — COMINCO

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Sold in United States by: AMERICAN METAL CLIMAX, INC., New York, Chicago, Detroit, Los Angeles

TADANAC ZINC SHAPES THE THINGS TO COME

9109

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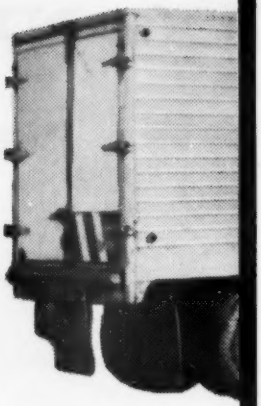
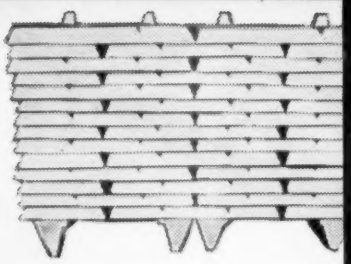
when you need zinc slabs right in your plant tomorrow*. . .



*Overnight truck delivery in eastern U. S.

and you want to conserve space & handling time . . .



Special interlock makes it easy to bulk pack and store

be sure to specify zinc slabs by GENERAL SMELTING

General's QUAKER brand Prime Western, IDEAL brand Brass Special and VICTOR brand Intermediate grade, fine quality Zinc Slabs will be in your plant tomorrow if you call today... And, as the photo shows, General's Zinc Slabs are specially produced to interlock for easy handling...made in 50 lb. slabs, packed 3000 lbs. to a bundle or to your special requirements...
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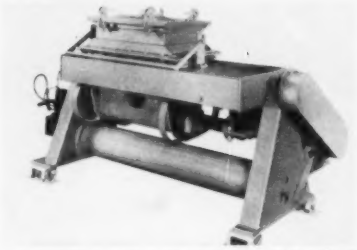
NEW PRODUCTS

continued from page 108

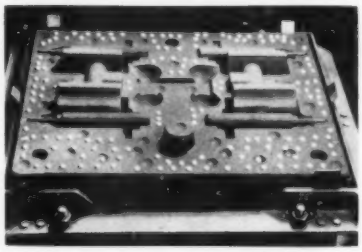
VIBRATORY FINISHING MACHINE



LORD CHEMICAL CORP. — Model 1930E, a 15-hp Lorco Vibrator, can be used for cleaning, descaling, deburring, fine finishing, burnishing or ball burnishing of metal parts. The unit is said to be 10 to 100 times faster than tumbling barrels of comparable capacity. Amplitude and frequency of vibration can be controlled, allowing the Vibrator to do coarse, delicate finishing.

Circle No. 268 on Reader Service Card

SHELL BONDING PROCESS



SHELL PROCESS, INC. — Shell Process Liquid Applicator is a new means for bonding mold halves. It increases available bonding areas, regardless of casting contour. Features include uniformity of drop, accuracy of placement and penetration of resin. These features are said to give castings with a closer tolerance through the parting line and complete elimination of resin drifting into mold cavities.

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LACQUERS FOR VACUUM METALLIZING OF POLYSTYRENE

SCHWARTZ CHEMICAL CO. — Lacquers for application before and after the desposition of aluminum in the vacuum metallizing of polystyrene, that provide high abrasion resistance and eliminate embrittlement and flake off have been de-

invest in

KERR

investments

AND SAVE MONEY TOO!

Modern manufacturing equipment, rigid quality control, assures uniformity from batch to batch.

KERR investments will fit your needs and cut production cost.

For Non-ferrous Metals

- **K-90**
- **DURACAST**
- **DURACAST-20**

For Ferrous Metals

- **FERROMOLD**

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Dealers
CASTING SUPPLY HOUSE
New York, New York
DICK ELLS CO.
Los Angeles, California

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veloped. BC-107, base coat, is a heat-cured lacquer that provides a smooth, unbroken, glossy surface. TC-101, top coat, is a tough non-yellowing lacquer.

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BARREL FINISHING MACHINE

TUMB-L-MATIC, INC. — Model XL-1414 is a specially designed barrel for ball burnishing of jewelry parts, and deburring small castings. The hexagonal barrel is 14" in dia., 15" long. Barrel speed is adjustable from 15 to 45 RPM.

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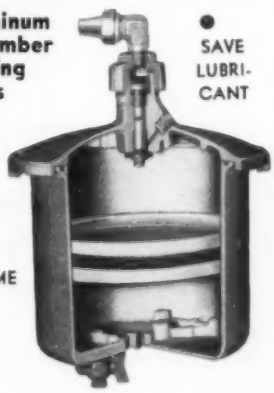
INCREASE YOUR PRODUCTION— *Reduce your costs with*

DORSEY PISTON AND CYLINDER LUBRICATOR

for aluminum cold chamber die casting machines



- SAVE LUBRICANT
- PRECISE LUBE CONTROL
- REDUCE DOWN TIME
- FEWER REJECTS
- INCREASE PLUNGER AND CHAMBER LIFE

Write now for literature, full details and prices . . .

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POUR EASIER, POUR FASTER, MORE POURS PER LADLE

***with* SPINCRAFT LADLES**

Light, rugged, Spincraft ladles save replacement costs, make every pouring job easier! Available in a vast range of sizes, in stainless steel as well as mild.

- **LIGHT IN WEIGHT LESS FATIGUE!**
- **NON-SPILL SHAPE NO WASTE!**
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Write Today for Complete Data and Prices.

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N. J. ZINC ANNOUNCES WINNERS IN METAL POWDER PRESS COMPETITION

THE NEW JERSEY ZINC CO. has announced the results of the Metal Powder Press Contest for nonferrous (brass and nickel silver) metal powder applications which closed June 30. The judges, Editors Philip Kalischer, PRECISION METAL MOLDING, Henry Clauser, MATERIALS IN DESIGN ENGINEERING, and E. J. Tangerman, PRODUCT ENGINEERING, found it difficult to select the top three from many outstanding powder metallurgy designs.

The winners are:

First Award ($200): R. F. Hatfield, Jet Research Center, for a shaped charge liner of brass powder. Formerly made of drawn copper, the liner utilizes special properties of brass powder metallurgy to hold the charge in place inside an industrial missile. Controlled particle size and density of the part allows complete frangibility for penetration of an oil well liner without the clogging effect of solid metal particles.

Second Award ($100): Meredith E. Smith, Minneapolis-Honeywell Regulator Co., for a terminal block assembly made of nickel silver powder. This design saves $1.97 per part over the old method of assembling individual terminals to a pre-molded block. Other benefits: controlled electrical conductivity, non-rusting finish without plating, improvement of the design, and greatly simplified assembly.

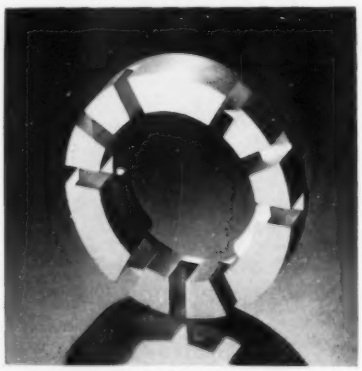
Third Award ($50): Phelps K. Tracy and Lewis N. Hatch, The Foxboro Co., for a proportional lever formerly machined from rectangular brass rod. Powder metallurgy eliminates 16 operations, achieves closer tolerances, gets a better non-rusting appearance without plating, and simplifies assembly – all at one-tenth of the former cost.

In addition to the prize winners, six other entrants who deserved special commendation were awarded citations of merit:

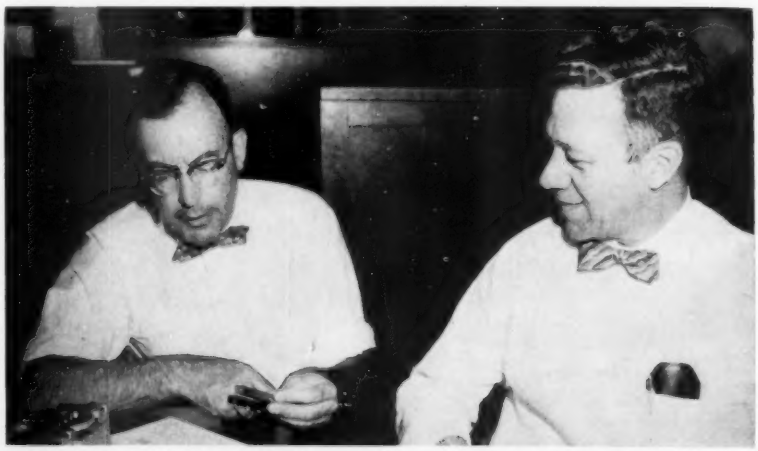
Paul P. Radecky, Hickok Electrical Instrument Co.; Glenn F. Balfanz, Jr., Chicago Pump Co.; George Patriquin, Independent Lock Co.; James Kessler, Stromberg-Carlson; Marcel P. Griffoul and Edward V. Madritsch, Controls Co. of America; Matthew S. Palazzolo, White Rogers Co.

The contest was held to "promote interest in imaginative and progressive use of nonferrous powder metallurgy in the design or redesign of industrial and consumer products."

FIRST AWARD: R. F. Hatfield. His entry was a brass powder charge liner.



SECOND AWARD: M. E. Smith, for a nickel silver powder terminal block.



THIRD AWARD: P. K. Tracy (left) and L. N. Hatch, for a brass powder lever.

What's more important to you

QDP or PDQ?*

Whirlpool Corporation reports: among 598,265 components supplied by Amplex the first 4 months of 1959, there were only 5 rejects!

Quality, Delivery, Price...
this Amplex philosophy enables our customers to cut their production and warranty costs.

The "Price" vendor with poor quality will increase your costs.

Amplex prices are low but cost-saving quality always comes first. A quality record of 99.999992% is the reason why Whirlpool Corporation says, "Quality is our business, too. That's why we purchase components from Amplex."

Contact your local Oilite® representative today. Reduce your costs with quality-controlled Oilite Precision Parts and Bearings. See "Bearings" in the Yellow Pages or write to Dept. L-9.

* *Quality-Delivery-Price vs. Price-Delivery-Quality*

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SINCE 1929 — A CHRYSLER PRODUCT — OILITE

the most trusted name in powder metallurgy!

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PRECISION PARTS • SELF-LUBRICATING BEARINGS • METAL FILTERS • FRICTION UNITS

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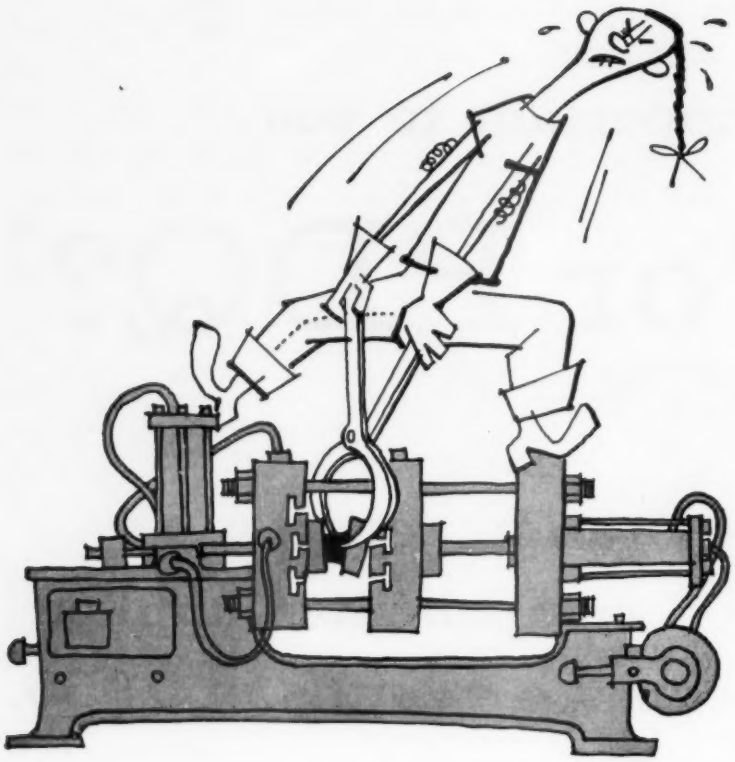

Don't have a tong war... use Die Slick!

There *is* something new under the die casting sun. It prevents sticking, scoring and soldering on aluminum die casting. Really remarkable is that you can thin brand new 44 Die Slick with WATER *or* kerosene *or* solvent *or* white oil *or* you name it. It sounds incredible, but it's in production use in dozens of big plants.

The people who thin it with water report excellent release properties without die checking. Furthermore, they report saving lots of money because they no longer need expensive thinners. 44 thins easily with 3, 4 or 5 parts water, and it won't settle out. There's no fire hazard, either.

The people who prefer to thin it with solvents say they get better release properties than with any other compound. Either way you use it (and we suggest you try both ways) you'll be pleased. Order a trial gallon today. If you don't like it, we'll pay the bill.

Die Slick is a registered trade mark of G. W. Smith & Sons, Inc.

DIE SLICK

used by die casters everywhere

G. W. SMITH & SONS, INC.,

1700 SPAULDING ROAD, DAYTON 3, OHIO

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INDUSTRY NEWS

continued

WERLEY GETS ASTM AWARD

WERLEY

In recognition of his many years of service to the AMERICAN SOCIETY FOR TESTING MATERIALS, George L. Werley, research investigator for The New Jersey Zinc Co., was given an award of merit at the recent annual meeting of the Society in Atlantic City. Werley has been secretary of ASTM's die casting committee for 21 years, and has written many papers and articles on zinc alloy die castings and nonferrous powder metallurgy.

ARWOOD GIVES EXPANDED CUSTOMER SERVICE

ARWOOD PRECISION CASTING CORP. has created a Dept. of Process Engineering to evaluate and coordinate laboratory development with actual production operations. Vice president in charge of the new department is Harry Matthieson, who points out that this streamlining process was done to improve the service provided by Arwood's customers.

Any development by one plant is automatically channeled to others in the shortest time possible. Thus, with Arwood's four plants which include east and west coast locations, this central coordination makes it possible for customers anywhere in the country to benefit almost immediately from a development at any Arwood plant.

Another advantage of the new department is that it is easier for Arwood to turn its entire organization toward solving specific technical problems posed by customers.

Another function of the department ties in with Arwood's continuing development program for improving investment casting techniques and methods. For example,

CASE HISTORIES FROM MT. VERNON FILES

University makes 3 speakers from 1 Mt. Vernon die casting

The advent of stereo has brought about a demand for smaller cabinets and posed a problem for speaker engineers: design a small moderately priced unit capable of sound reproduction as good as that of present day speaker systems 3 to 4 times its size.

University engineers came up with 3 answers—3 new 8 inch speakers with outstanding performance characteristics—made of highest quality materials, with a better finish than ever...all at greatest possible economy thanks to the use of Mt. Vernon Die Castings.

This zinc pressure die cast "basket" provides a universal 8" frame for three different speakers: 1—a full range 3 way diffaxial, 2—a standard woofer, and 3—a new type high compliance woofer. This single part, formerly made of several stampings, contains the supports, flanges, slots, ribs, holes, studs and channels for all three models. It possesses all the rigidity and dimensional stability needed to assure permanent centering of the speaker cone, voice coil and magnetic element at increased power ratings.

Designed to very close tolerances, the castings are dependably uniform from speaker to speaker. They offer better design, greater rigidity and reliability than the assembled stamped basket at no increase in cost. Best of all, final speaker assembly is speeded up with fewer steps, resulting in greater economies, enabling University to offset steadily increasing general production costs. The finished products have a superior quality look that matches their superlative performance.

Back and front the casting is intricate, and the die even more so. However, Mt. Vernon's complete fourfold service takes these complex casting assignments in stride, gives service that more than satisfies...service that keeps customers happy for years and years...in the case of University Loudspeakers, Inc., of White Plains, N. Y....for over 15 years.

If you too would like to switch to die castings, let's talk it over. A call to your nearest sales representative will get you fast service.

MT. VERNON
DIE CASTING CORP.
STAMFORD, CONNECTICUT

RESEARCH FOUNDATION PARTICIPANT

SALES REPRESENTATIVES

BALTIMORE, MD.: Mr. C. M. Gordan, 919 St. Paul St.
BROOKLYN, N. Y.: Mr. Robert V. Moore, 2317 Plumb 2nd St.
CLEVELAND, OHIO: Mr. Grant Eller, 6 East 194th St.
GUILDERLAND, N. Y.: Mr. David H. King, 75 Willow St.
PITTSBURGH, PA.: Mr. Andrew W. Anderson, 300 Pasadena Drive So.
QUINCY, MASS.: Mr. Edmund W. Libby, 91 Merrymount Rd
ROCHESTER, N. Y.: Mr. William Sauers, 101 Briarcliff Rd.
SKANEATELES, N. Y.: Mr. Jerome J. Theobald, 9 E. Genesee St.
STAMFORD, CONN.: Mr. Anker Anderson, Cascade Road
VALLEY FORGE, PA.: Mr. G. T. McMaster, P.O. Box 115

For more information circle No. 60 on the Reader Service Card

INDUSTRY NEWS

continued

many developments which seem feasible in the laboratory may prove impractical in actual production. Thus, the new department will take these laboratory developments and channel them to the plant best suited (by reason of equipment, personnel, or other factors) to carry out actual production testing.

This cooperation between laboratory and plant is illustrated by Arwood's recent development of Suparcast, an aluminum casting technique which produces investment castings with superior mechanical properties. In development this process, the laboratory did much of the basic research. However, it was on the production floor of the Tilton plant that Suparcast was found to be a practical production reality.

In fact, the successful development of Suparcast was a vital factor in the decision to form the Dept. of Process Engineering.

everyone takes advantage of us

By "everyone" we refer to our customers. They take advantage of us. And as for us . . . we go for it!

Take our field metallurgist, for example. Our customers take him. They are always taking him — right to their plants for consultation and counsel on planning new products and solving present production problems. This service costs the customer nothing . . . often saves him a lot. This on-the-scene assistance is part of Henning's program of providing *customized alloys and customized service.*

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Smelters and Refiners of aluminum, bronze, brass, zinc, lead. Producers of ZAMAK alloys.

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DUPLICAST USING SHAW PROCESS

SIELAFF

DOYLE

DUPLICAST CORP., Detroit, has opened its complete foundry facilities for the operation of the Shaw Process method of precision casting. The firm will use the Shaw Process to produce all forms of precision cast tooling and prototypes, in a wide range of ferrous and nonferrous alloys. Carl F. Sielaff, Jr., is president of Duplicast; Thomas P. Doyle is general manager.

ADCI SETS MEETING

The 1959 annual meetings of the AMERICAN DIE CASTING INSTITUTE and the DIE CASTING RESEARCH FOUNDATION have been set for Sept. 16 and 17 at the Edgewater Beach Hotel, Chicago. The accomplishments of the past year will be reviewed, and plans will be made to further strengthen die casting services to industry.

DOW FORMS NEW DIV.

THE DOW CHEMICAL CO. has formed a new division for the fabrication and semi-fabrication of magnesium, aluminum, and other metals. The new division, THE DOW METAL PRODUCTS CO., will replace the DOW MAGNESIUM PRODUCTS DEPT. Officers of the new division are: Hubert Fruehauf, president; Dr. J. Donald Hanawalt, vice president; Herbert H. Lyon, vice president and chief financial officer; Donald H. Gilmore, vice president and sales manager; Arthur W. Winston, Sr., assistant to the president and secretary.

DIE CASTING ENGINEERS PLAN EUROPEAN TOUR

The SOCIETY OF DIE CASTING ENGINEERS is organizing a European tour in May, 1960, for members. The tour is being scheduled to permit attendance at the Third International Die Casting Conference in Stresa, Italy. The conference pro-

gram, May 16-20: Monday afternoon, reception and cocktail party; Tuesday morning, opening of the conference and technical sessions and discussions; Tuesday afternoon, technical sessions and discussions; Wednesday morning, technical sessions and discussions; Wednesday afternoon, special questions and answers session; Wednesday evening, closing banquet; Thursday and Friday, visits to works in North Italy. A special program is being arranged for wives of delegates. For more details, contact Harry Cagin, Halex Die Casting Co.

SIKORSKI HEADS NEW DIE CASTING FIRM

SIKORSKI

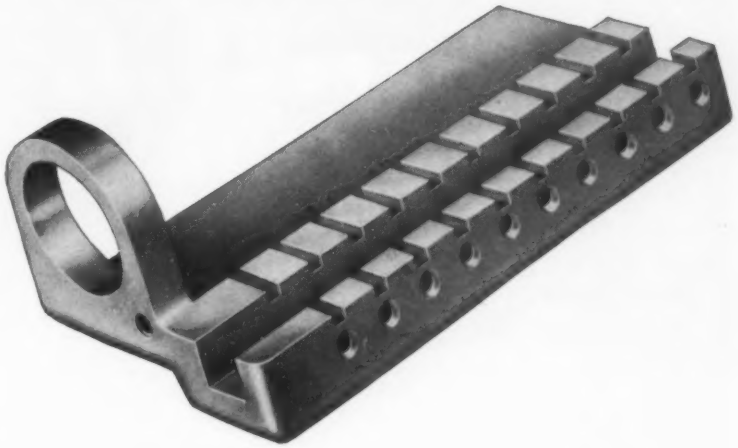
A new die casting corporation — PRECISE CASTINGS, INC. — has been formed, and its president is John P. Sikorski, former vice president and general manager of S. U. S. Die Casting Co. Manufacturing vice president of the new firm is Ted Pickering, formerly vice president and general manager of Doehler-Jarvis Div.'s Batavia plant. Sikorski plans to perfect a new vacuum process in the pilot plant in Lafayette, Ind.

ALCOA NAMES BUTLER CASTING SALES MANAGER

William R. Butler has been appointed manager of casting sales at ALUMINUM CO. OF AMERICA. In charge of die casting sales since 1955, Butler will be responsible for the sale of sand, die, permanent mold, and plaster castings.

REYNOLDS EXPANDS EXTRUSION ACTIVITY

REYNOLDS METALS CO. has created a new executive post to coordinate efforts to expand its extrusion business. H. E. Miller, formerly manager of the Reynolds ex-



IBM *specified die casting*

...to save machining

How else could this International Business Machines part be made?

It could be milled, machined and bored. But costs would be exhorbitant. It could be cast by other methods. But accuracy and subsequent machining operations would be costly.

Look at the job! 12 cores, 10 slotted surfaces, planes on varying levels. Tolerances as exacting as ± .002, non-accumulative between holes and slots.

IBM desired to eliminate post-casting operations. Twin City Die Castings made die and castings to meet exacting requirements. Result: costs held, performance insured, the die casting process demonstrated its flexibility.

Perhaps die casting can pay you in precision, appearance, fewer assembly steps . . . by cutting your costs. Call or write. A Twin City Die Castings engineer can help die casting pay for you.

...only DIE CASTING can
✔ cut your costs ✔ offer such flexibility
✔ provide such accuracy

Leading Die Casters in the Upper Midwest

TWIN CITY DIE CASTINGS CO.

3351 TALMADGE AVE. S. E. • MINNEAPOLIS 14, MINN. • PHONE MI 6-7528

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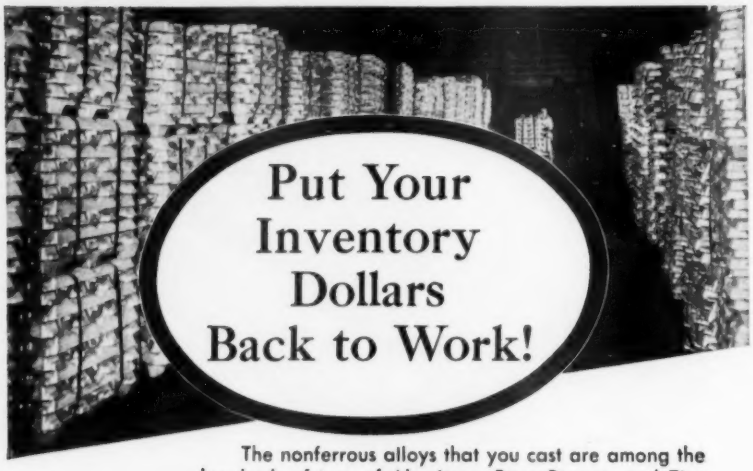

The nonferrous alloys that you cast are among the hundreds of tons of Aluminum, Brass-Bronze, and Zinc alloys that we stock . . . ready for immediate delivery anytime. Depend on the George Sall Metals Company to keep you on schedule . . . and to keep your dollars active.

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INDUSTRY NEWS

continued

trusion plant in Phoenix, will coordinate production in all Reynolds extrusion plants with customer service, assisting sales, product development, and other divisions of the company. Russell V. Bobb, formerly assistant manager of the extrusion division, succeeds Miller in Phoenix.

MAGNESIUM ASSOCIATION TO MEET NEXT MONTH

The Hotel Roosevelt will be headquarters for THE MAGNESIUM ASSOCIATION's 15th annual convention October 19 and 20 in New York.

The theme of the convention will be "Magnesium techniques and trends . . . a review and projection." It will be open to all who are interested as users or potential users of magnesium. Papers will deal with fabrication and application. Component parts and products of magnesium will be exhibited.

Details are available from The Magnesium Association, 122 E. 42 St., New York.

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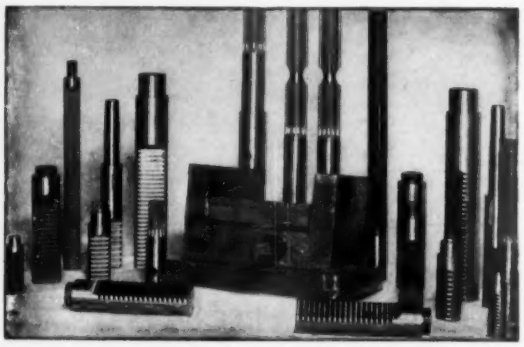
PINIONS and RACKS
FOR DIE CASTING & PERMANENT MOLDS



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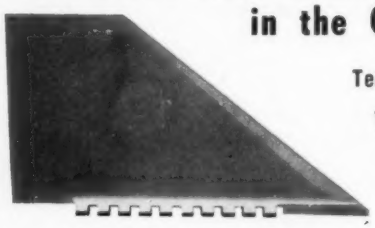
Guaranteed Mechanical Properties in the Casting



Tensile — 45,000 psi
Yield — 38,000 psi
Elongation — 3%

Bullpup Missile Wing Casting

We can do the same for YOU
For HIGH STRENGTH castings in

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CHECK with H & S — Specialists in High Strength precision castings by the Permanent Mold and Centrifugal Casting processes.

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For further information contact . . .

H & S Metal Products Co.

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ANGELUS
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LETTERS

continued from page 6

VACUUM DIE CASTING

We have read with interest the article on page 28 of the June issue of PRECISION METAL MOLDING dealing with the vacuum casting of aluminum alloys.

We are highly interested in this problem, but development in this country is difficult because one of the major patents is in the hands of Sparklets, Ltd. of London, and they are not disposed to issue licenses to other users. We should be much obliged, therefore, if you could let us know whether the system described in the article and made by the Cleveland Automatic Machine Co. is subject to any patent restrictions. You mention in the article that it is an improvement on the Morton vacuum system but, here again, we are not aware that this system is patented in this country.

We should be obliged for any further information, F.M.P., director (England).

The system of vacuum casting described in our June issue, and used by Cleveland Automatic Machine Co. is, I believe, subject to some patents held by Mr. Morton.

For clarification of the patent situation, I have refered your letter to Cleveland Automatic for a firm answer.—ed.

? ? ? ? ? ? ?

We have interest to use the machinery (equipment) to construe toys; machinery which are not used by some U.S.A. Firm for it is not more suitable to construct toys recently fallen down of fashion.

If you Know some Firm that is disposed to pass this machinery to other Firm, or some Agency specialized in search this Firm in USA for setting us in contact, please notice us as soon as possible.

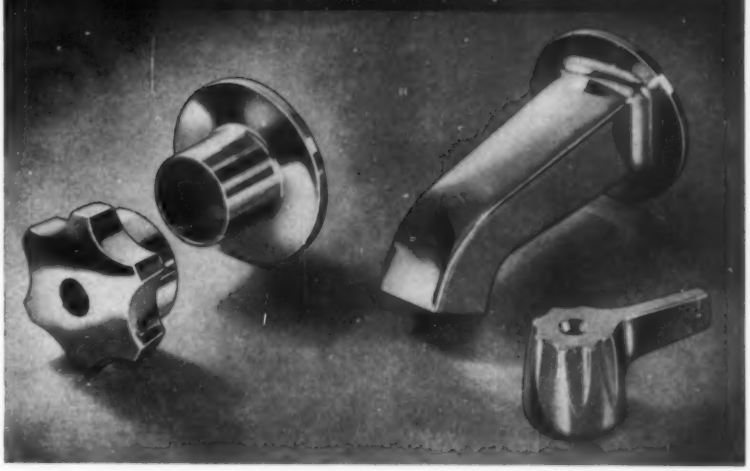
Thanking you in advance we remain with the pleasure of your reply and we are. C.Z. (Italy).

? ? ? ? ?—ed.

DENISON SHIFTS HORNE

Bruce R. Horne, a New England field engineer for DENISON ENGINEERING DIV., AMERICAN BRAKE SHOE CO., has been transferred to the home office in Columbus, Ohio, where he'll head government sales.

QUALITY is a FIXTURE at L.D.C.



. . . and these fine finish plumbing fixtures tell you why

Quality is fashioned by craftsmanship. Take these sparkling chrome plated zinc castings. Note their modern, graceful lines and soft, smooth finish . . . made possible only by the qualities of purity and surface soundness and uniformity of the alloy; and the rigid maintenance of close tolerances by controlled production methods and equipment.

And here is something else! The serrations for the mating spline in the handles of these fine fixtures are held to close dimensional tolerances by reason of the identical same qualities that govern the economical production of these castings.

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20001 West Lake Road
Tel: Edison 1-6888

DAYTON, OHIO
J. M. Gallaher
363 West First St.
Tel: Baldwin 4-3523

DETROIT, MICHIGAN
J. R. Lemen, Jr.
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Tel: Trinity 3-5910

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Tel: Fireside 8-3985

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Latrobe Die Casting Co.
Latrobe, Pennsylvania

Established 1918

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100% MORE DUCTILE
with lithium stearate
Recent research indicates improved physicals for brass compacts using lithium stearate as a lubricant and nitrogen as the sintering atmosphere.
Typical results promise 20% stronger, 100% more ductile parts as well as safer, more economical sintering operations.
TRY IT NOW YOURSELF!
All you need is a special powder metallurgy grade lithium stearate (fluffy) available only from us. We'll send you complete facts and lubricant samples on letterhead request. Foote Mineral Company, 474 18 West Chelten Bldg., Phila. 44, Pa.
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MINERAL COMPANY
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PMM OPPORTUNITIES

jobs & equipment

Opportunities rates: $20 for the first column-inch; $15 for each additional column-inch payable in advance. To answer box number advertisements, address responses to the box at Precision Metal Molding, 812 Huron Rd., Cleveland 15, Ohio. Closing date: 1st day of month preceding publication.

POSITIONS OPEN

METALLURGIST

With Investment Casting experience. Midwestern producer. Send Resume. Our Personnel are aware of this ad. Box 9159.

Men wanted. Experienced personnel in investment casting. Position open due to expansion Good opportunity for capable men. REX PRECISION PRODUCTS INC., 11825 Major Street, Culver City, California.

Sales Representative — by progressive New England precision die casting company producing zinc and aluminum die castings. Choice territory open for qualified sales personnel. Commission basis. Address all correspondence to Box 9259.

DIE CASTING — DIE DESIGNER — The Light Metals Division of Thompson Ramo Wooldridge, Inc. has an immediate opening in Cleveland, Ohio for a design engineer experienced in the design of aluminum die casting dies. Graduate engineer preferred but will consider equivalent experience and education. This is an excellent opportunity with a progressive company. Mail complete resume to Employment Manager, Thompson Ramo Wooldridge, Inc., 6410 Cedar Avenue, Cleveland 3, Ohio.

ENGINEER — SALESMAN

Midwest's leading, independent, fabricator of Powdered Metallurgy components offers an excellent opportunity for a self starting, aggressive man on its expanding sales force. Prefer individual with sales experience and technical degree. Ability to grasp mechanical design problems and metallurgical background important. Send complete resume to Ferro Powdered Metals, Inc., Box 312, Salem, Indiana.

REPRESENTATIVES WANTED

JOBBERS WANTED

We manufacture Kob-Kleen (ground corn cobs) for deburring, burnishing, polishing and soft grit blasting of metals; metal stamping absorbents, etc. Nationally advertised. Coeval, Inc., Dept. J, St. Joseph, Illinois.

EQUIPMENT

ALUMINUM FURNACE

1 Lindberg-Fisher 1000# hand-tilt aluminum melting furnace in excellent condition with blower and 2½ H. P. motor, gas-fired, and a brand new uncrated cruicible. Cost $3,850.00 asking price $1,000.00.

1 Lindberg-Fisher 4-burner, gas-fired motorized tilt 2½ H. P. motors, built in blower; in excellent condition, newly painted and serviced. Original cost $4,850.00 asking price $1,350.00.

1 Stroman dual chamber horizontal melting furnace, air tilt; double pyromotor and recording controls; just rebricked; latest in modern melting equipment; delivers 1100 lbs. per hour. Make offer. BASIC ALUMINUM CASTINGS COMPANY, 1325 E. 168th St., Cleveland 10, Ohio, IVanhoe 1-5606.

DIE CASTING MACHINES

250 ton Lake Erie & Reed-Prentice, for zinc, with hydraulic closing and air shot with thermo, controls and motors, new in 1946. 75 H.P. Air Compressor, water cooled, twin cylinders 15" x 9" x 10", air receiver, after cooler, G. E. Motor electrical controls. Camras Equipment Co., 30 So. Clinton St., Chicago 6, Ill. Andover 3-4136.

WANTED—Reed Prentice 1½ Zinc, late. Die Casting machines to REBUILD.
FOR SALE—Send for list of 50 machines. Fred C. Ziesenheim, M.E., 523 King Avenue, Marion, Ohio.

AJAX MAGNETHERMIC FORMS CANADIAN SUBSIDIARY

AJAX MAGNETHERMIC CORP. has formed a Canadian subsidiary, AJAX MAGNETHERMIC CANADA, LTD., at Ajax, Ontario. The company will market the products of the three divisions of the parent company in Canada, including low frequency melting furnaces of AJAX ENGINEERING DIV., high frequency melting furnaces of AJAX ELECTROTHERMIC DIV., and billet heaters and heat treating equipment of MAGNETHERMIC DIV.

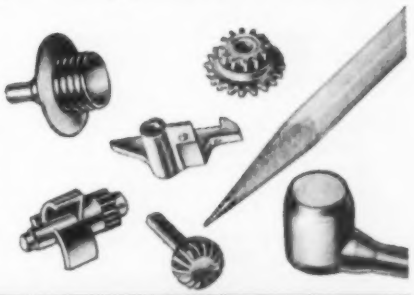
Ivor Slater has been elected president of the new firm, and Bruce E. McArthur, vice president. John A. Logan is chairman of the board.

FETTER BROTHERS EXPANDING AGAIN

FETTER BROTHERS ALUMINUM MFG. CO., extruder located in Jeffersonville, Ind., is planning the fourth expansion in its 11-year history. The company has bought four buildings in Jeffersonville, and will use two of them for additional manufacturing and fabricating facilities.

GRC produces tiny die castings, exclusively! One fast automatic operation turns out simple or intricate parts, high in quality, low in cost

Gries' exclusive patented methods make possible wide design latitude . . . assure uniformity, accuracy and smooth surfaces on small parts of all types . . . for a wide variety of uses . . . at substantial savings. GRC die castings leave the machines trimmed, ready-for-use. In addition GRC's unique single cavity die casting techniques offer new shortcuts in assembly . . . new approaches in product design through our exclusive methods.



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Maximum sizes
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tiny die castings exclusively

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Movable, multiple element units "cast-assembled" in one automatic operation.

Automatic **INSERT** casting of individual, multiple or continuous elements or parts.

Perfect **MATING** of any number of zinc alloy or thermoplastic parts.

GEARS and PINIONS cast in one piece with shafts, center holes, or in combination with cams, hubs, spacers and flanges.

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GRIES

CLIP THIS TO YOUR LETTERHEAD

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YES send complete catalog describing GRC automatic Die Casting methods including design hints.

☐ Send assorted samples ☐ Quote-info attached

☐ Yes ☐ No. Have representative phone for an appointment.

For more information circle No. 41 on the Reader Service Card

DATA OFFERED IN THIS MONTH'S ADS

Qualified readers may obtain any of these free reference materials by circling the numbers on the Reader Service Cards facing Page 126

1. **Lubrication**—Technical data on graphite-water base dispersions for forging lubrication is available from Acheson Colloids Co.

2. **Die Castings** — Brochure on the company's "Cost-Planned" method of producing castings, from blueprint to delivery of the finished product. Advance Pressure Castings, Inc.

3. **Sinterings** — Engineering Bulletin 3020 from American Sinteel Corp. gives technical data on ferrous and non-ferrous powdered metal products and their design.

10. **Investment Casting** — "Practical Guide to Investment Casting" is a 14-page design handbook from Arwood Precision Casting Corp.

12. **Plunger Rings** — Literature on The Auto-Diesel Piston Ring Company's tip and ring plunger combination that solves the problem of scored or worn tips.

13. **Induction Melting** — Data bulletins on induction melting equipment with multiductor power. Features include: less initial cost; less operating cost; and less maintenance and material cost. Ajax Electrothermic Div., Ajax-Magnethermic Corp.

14. **Die Casting Machines** — Complete details on a line of high-pressure cold-chamber and hot-chamber die casting machines in capacities from 125 to 1,000 tons. B & T Machinery Company.

17. **Sintering** — The "Engineering Handbook of Powder Metallurgy" and Catalog No. 58, which lists 2,227 sizes of completely finished cast bronze sintered oil-filled bearings, are available from Bunting Brass & Bronze Co.

18. **Die Casting Machines** — Complete line of Cast-Master die casting machines is described in Catalog CM-100 from H-P-M Div., Koehring Co.

23. **Fire-Resistant Fluids**—Technical bulletin on Cellulubes that are available in six ranges of viscosity. Celanese Corp.

24. **Die Casting**—"Behind the Scenes" is a report from Hampden Brass & Aluminum Co. on their facilities for handling your aluminum and zinc die casting requirements.

25. **Die Castings** — Brochure from DiSalle Plating & Die Casting Co., presents a picture story on their facilities for making your specialized die castings.

26. **Lubricant**—Technical literature on Plunger Lube Lite Special, a die casting lubricant that flows at room temperature for the automatic systems of lubrication. The Die Casting "ID" Corp.

28. **Standardized Die Components** — which reduce design time and cut die construction costs, are described in a 170-page catalog. The Detroit Mold Engineering Corp.

29. **Die Castings** — "Zinc Die Castings Savings" explains company's facilities for producing castings at minimum cost. Dieco Die Casting Co.

31. **Die Castings**—16-page facilities brochure shows the company's die-casting techniques for solving rigid design requirements in zinc and aluminum castings. Dollin Corp.

32. **Investment Casting Cores** — Du-Ceramic, a new material for investment casting cores, is described in technical literature from Du-Co Ceramic Co.

35. **Trim Press** — Case histories and catalog on the Federal Press Company's new "Flying Cutoff" that boosts output — reduces costs.

36. **Die Casting Compounds** — and other specialty lubricants and coolants are described in bulletins offered by Fiske Bros. Refining Co.

38. **Grain-Refining Compounds** — that will improve the physical properties of aluminum castings are discussed in a technical bulletin from Foundry Services, Inc.

39. **Eliminate Porosity**—Technical bulletin tells how Foseco Degasers eliminate pinhole porosity and oxide inclusions in aluminum castings. Foundry Services, Inc.

41. **"Small Die Castings Exclusively"** — is the title of a bulletin from Gries Reproducer Corp. The company's method for delivering parts of high uniformity, with close tolerances, is explained.

44. **Refractory Mold Materials** — Calamo for investment molds and H-W Flintgrain for ceramic shell molds are described in technical literature from Harbison-Walker Refractories Co.

47. **Zinc Die Casting Facts** — Henning Bros. & Smith, Inc. has issued an engineering data book on "Die Casting With Zinc Base Alloys".

51. **Die Casting Machines**—Completely new catalog from Kux Machine Co. illustrates the features and models of a new line of Kux die casting machines.

53. **Die Steel**—Technical data sheet on VDC Type H-12 hot work steel that is easy to machine, responds uniformly to heat treatment. Latrobe Steel Co.

54. **Die Casting Machines** — Lester-Phoenix, Inc. wants you to check the specifications on its die casting machines if obsolete equipment is stealing your profits.

56. **Die Castings** — Design data from Litemetal Dicast, Inc. on aluminum, magnesium and zinc die castings.

65. **Cutting Costs**—with brass powder metallurgy. Engineering data booklet evaluates this production method in terms of particular needs. The New Jersey Zinc Co.

67. **Extrusions**—Brochure from Precision Extrusions, Inc. gives detailed case studies on cost-cutting examples of aluminum extrusions.

68. **Die Castings** — Brochure from Paramount Die Castings Co. serves as a brief guide to designing for die castings and shows the company's facilities.

71. **Cleans, Lubricates** — That's what the Air-Lube System, manufactured by Pierce-Waller, Inc. does. Technical data sheets are available.

72. **Vacuum Die Castings** — Literature on vacuum die castings and the Premier Die Casting Company's facilities for producing them.

73. **Die Castings**—Literature describes the company's facilities for producing precision aluminum die castings. Precise Castings, Inc.

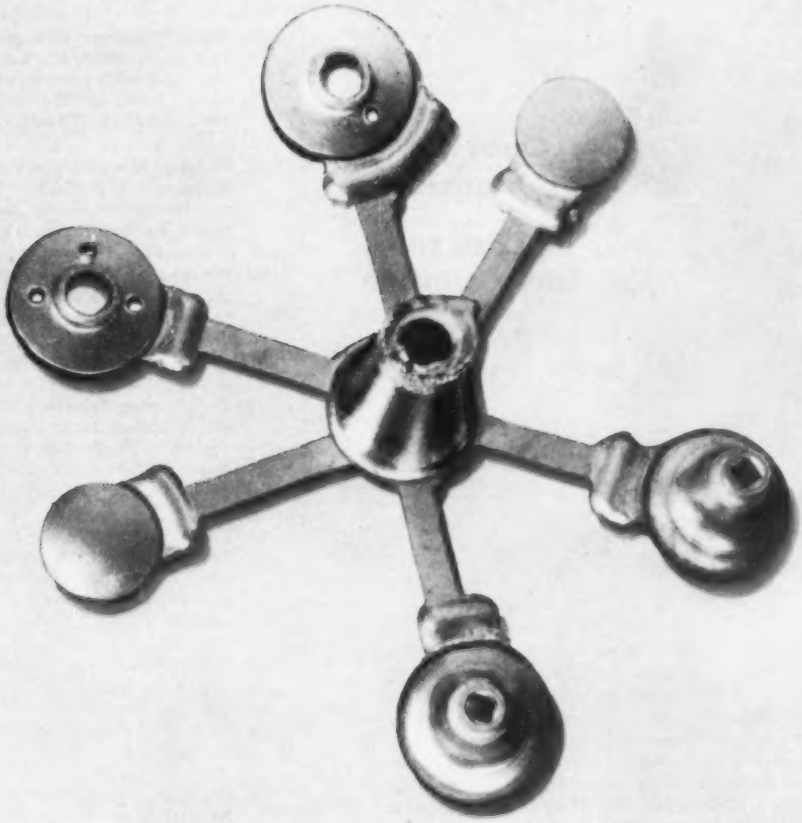
74. **Metal Powders**—Technical Booklet ADV 1014 contains data on Types G, N, S and Type MS powders. Chemical composition, physical

continued on page 124

Circle No. 7 on Reader Service Card

Your surest start for fine die casting: Federated-Asarco Di-Metal is made from special high grade zinc, electrolytically refined by Asarco-developed processes. Production is now concentrated "under one roof" at Corpus Christi, Texas, one of the world's largest high grade zinc producing plants. Integrated production—controlled from mine to finished alloy—assures you of lower cost materials, and the highest purity and uniformity of zinc Di-Metal. Federated can serve your needs through 22 sales offices. There's one near you. Federated Metals Division, 120 Broadway, New York 5. In Canada: Federated Metals Canada, Ltd.—Toronto and Montreal.

FEDERATED METALS DIVISION OF



ASARCO

AMERICAN SMELTING AND REFINING COMPANY

DATA IN ADS

continued from page 122

properties, and test evaluations on Type HS6460 are contained in Booklet ADV 1028. Republic Steel Company.

76. Sintering Savings—A technical report, "How to Cut Costs With The Remet Powdered Metal Process" is available from Reese Metal Products Corp.

82. Ladles—Technical data and prices are available from Spincraft, Inc. on their line of stainless steel ladles.

83. Statistical Quality Control — for die castings. Technical literature from Stroh Die Casting Co., Inc. describes their use of quality control for lower inspection costs.

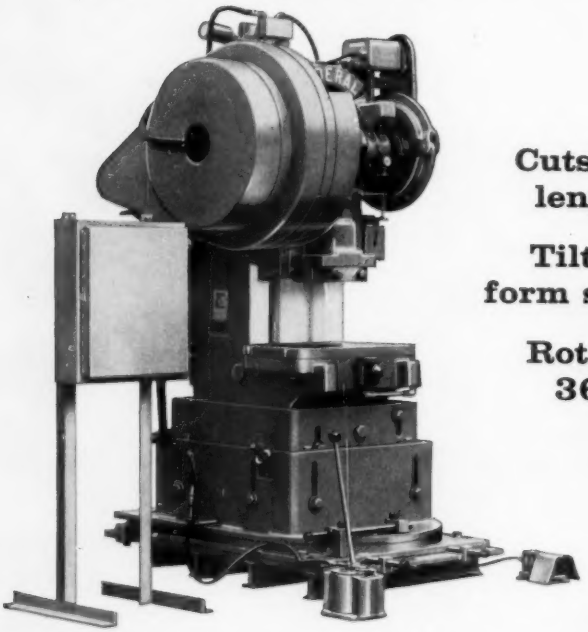
84. Die Casting Machine—Complete specifications and catalog on a 2500-ton die casting machine specially developed for casting cylinder blocks. A. Truilzi.

86. Fire-Resistant Hydraulic Fluids — "Ucon Hydrolubes Spell Safety", a technical report on laboratory tests. Includes service records. Union Carbide Chemicals Co.

New FEDERAL

"FLYING CUTOFF"

boosts output–reduces costs!



Cuts any length

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87. Die Steel—Technical data on vacuum degassed Thermold AV die casting die steel. Universal-Cyclops Steel Corp.

90. Piston Lubricator—Data folder describes the Dorsey automatic piston and cylinder lubricator for aluminum cold chamber die casting machines. Westbrook Mfg. Co.

91. Finishing Data File — on process chemicals for the metal finishing industry. Allied Research Products, Incorporated.

92. Finishing Equipment — Almco, Queen Products Div., King-seeley Corp., has issued an album of new products which contains brochures on a spindle machine, Vibrasheen, and price lists on compounds and media for barrel finishing.

93. Metal Preservative — Technical literature describes Enteks, a new series of rinse water additives that give metal surfaces a protective coating against the atmosphere. Enthone, Inc.

94. Barrel Finishing—40-page technical manual describes Carbotrol 7, a 7 step process for precision controlled barrel finishing. Electro-Minerals Div., The Carborundum Co.

96. Polishing Machinery—Catalog from Hammond Machinery Builders, Inc. shows a complete line of polishing and buffing machinery.

97. Phosphating, Cleaning — Technical literature is available on Prep products and processes for phosphating, conversion coating, cleaning, etc. Neilson Chemical Co.

98. Cuts Plating Rejects—Bulletin F-9822 describes Oakite Rinsite. When added to the final rinse, it stops water spotting and staining. Oakite Products, Inc.

99. Electrostatic Spray Painting — Technical literature on the Ransburg No. 2 Process Electrostatic Hand Gun. Ransburg Electro-Coating Corp.

114. Master-Molds—and cavity blocks, where you shoot in the lower position and mold vertically, are described in engineering data from Richards Tool & Mold Co.

115. Fire-Resistant Hydraulic Fluids — Booklet gives facts, specifications Pydraul A-200, a new low-cost all-synthetic hydraulic fluid. Monsanto Chemical Co.

117. Melting Equipment — Catalog M-1 from Milles Equipment & Supply Co. gives detailed information on a complete line of melting equipment for die casters and non-ferrous foundries.

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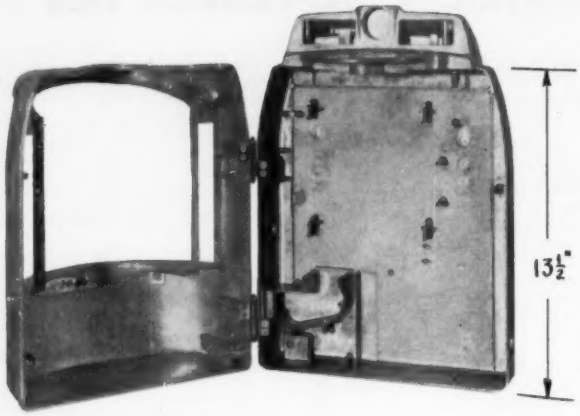

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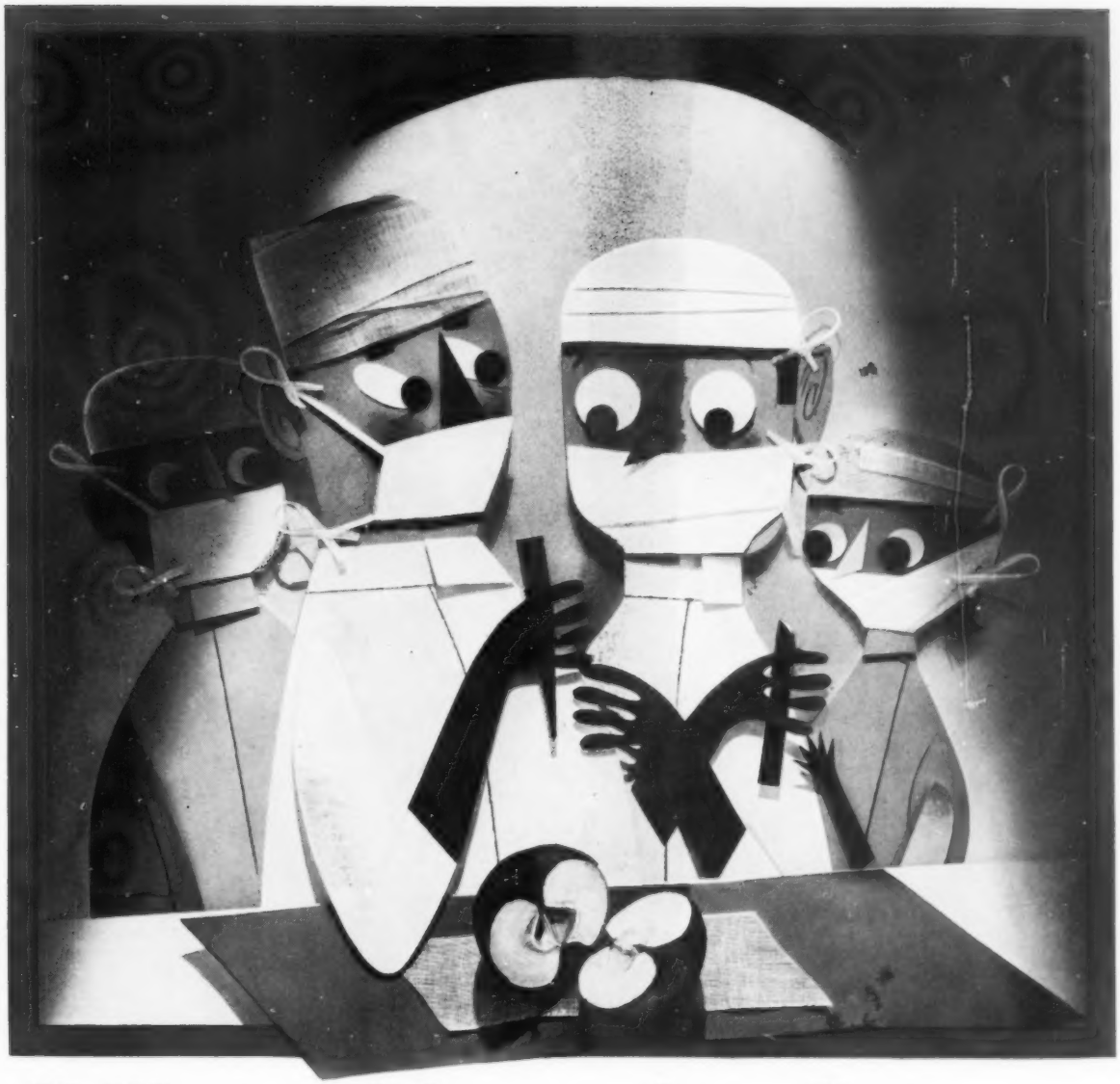

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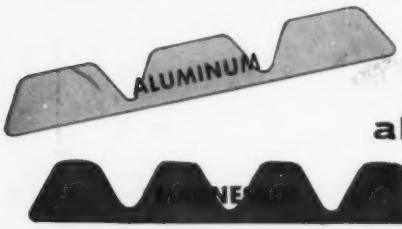

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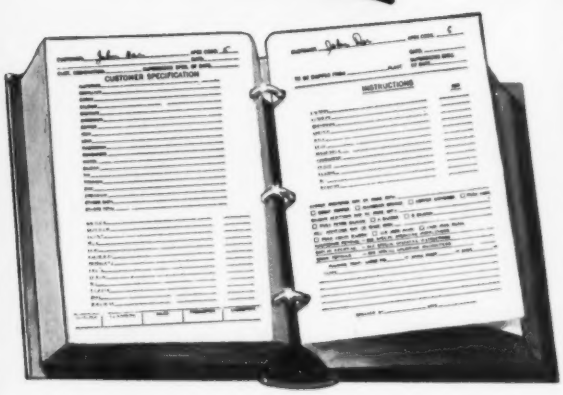

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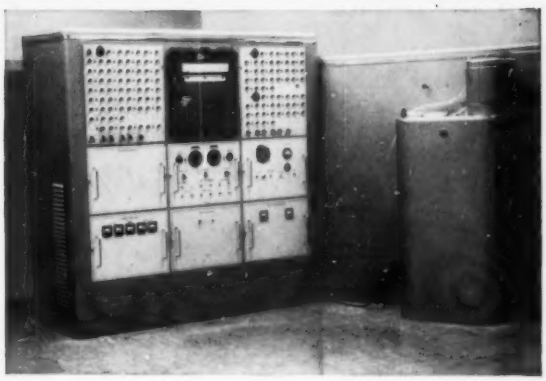

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